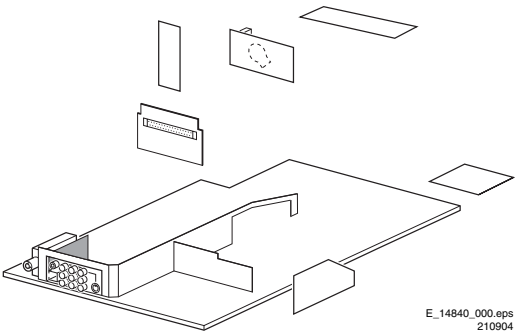


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Service Manual

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1. Technical Specifications, Connections, and Chassis Overview

Notes:

- Described specifications are valid for the *whole* product range.
- Figures below can deviate slightly from the actual situation, due to different set executions.

1.1 Technical Specifications

1.1.1 Reception

Display type	: CRT-DV-SF
Screen size	: 27", 4:3
	: 32", 4:3
Tuning system	: PLL
Color systems	: NTSC
Sound systems	: BTSC
Channel selections	: 181, full cable
IF picture carrier	: 45.75 MHz
Aerial input	: 75 ohm, F-type
A/V Connections	: NTSC M (3.58 - 4.5)

1.1.2 Miscellaneous

Audio output:	: 2 x 5 W
	: 2 x 10 W
Power supply:	
- Mains voltage range	: 90 - 140 V _{ac}
- Mains frequency	: 60 Hz
Ambient conditions:	
- Temperature range	: +5 to +45 deg. C
- Maximum humidity	: 90% R.H.
Power consumption:	
- Normal operation	: from 56 W (25")
	: to 70 W (32")
- Standby	: < 1 W

1.2 Connections

Note: The following connector color abbreviations are used (acc. to DIN/IEC 757): Bk= Black, Bu= Blue, Gn= Green, Gy= Grey, Rd= Red, Wh= White, Ye= Yellow.

1.2.1 Top Control and Front / Side Connections

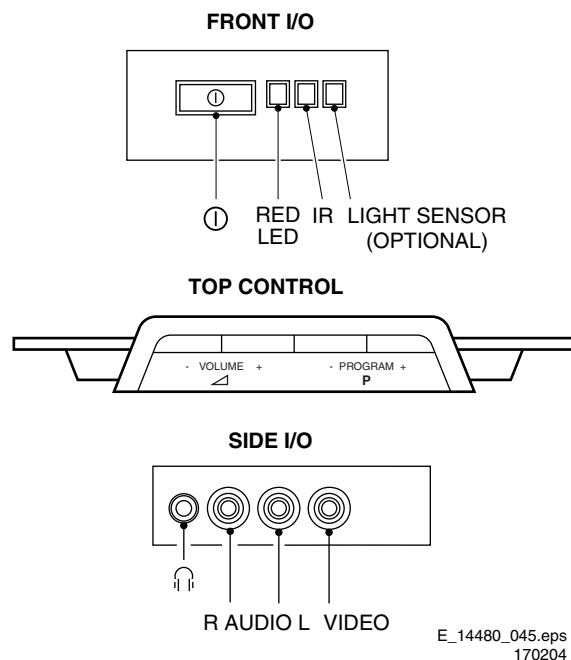
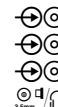


Figure 1-1 Top control and Front / Side connections

Audio / Video In

Ye - Video (CVBS)	1 V _{pp} / 75 ohm
Wh - Audio - L	0.2 V _{rms} / 10 kohm
Rd - Audio - R	0.2 V _{rms} / 10 kohm
Bk - Headphone	8 - 600 Ohm / 4 mW



1.2.2 Rear Connections

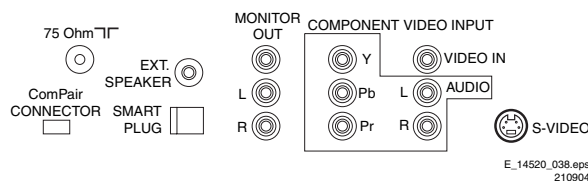


Figure 1-2 Rear connections

Aerial In

- F-type	Coax, 75 ohm
----------	--------------



Monitor Out

Ye - Video (CVBS)	1 V _{pp} / 75 ohm
Wh - Audio - L	0.5 V _{rms} / 1 kohm
Rd - Audio - R	0.5 V _{rms} / 1 kohm



YUV In

Bu - U	0.7 V _{pp} / 75 ohm
Rd - V	0.7 V _{pp} / 75 ohm
Gn - Y	0.7 V _{pp} / 75 ohm



AV1 In

Ye - Video (CVBS) 1 V_{pp} / 75 ohm
 Wh - Audio - L 0.5 V_{rms} / 10 kohm
 Rd - Audio - R 0.5 V_{rms} / 10 kohm



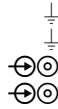
AV2 In

Ye - Video (CVBS) 1 V_{pp} / 75 ohm
 Wh - Audio - L 0.5 V_{rms} / 10 kohm
 Rd - Audio - R 0.5 V_{rms} / 10 kohm

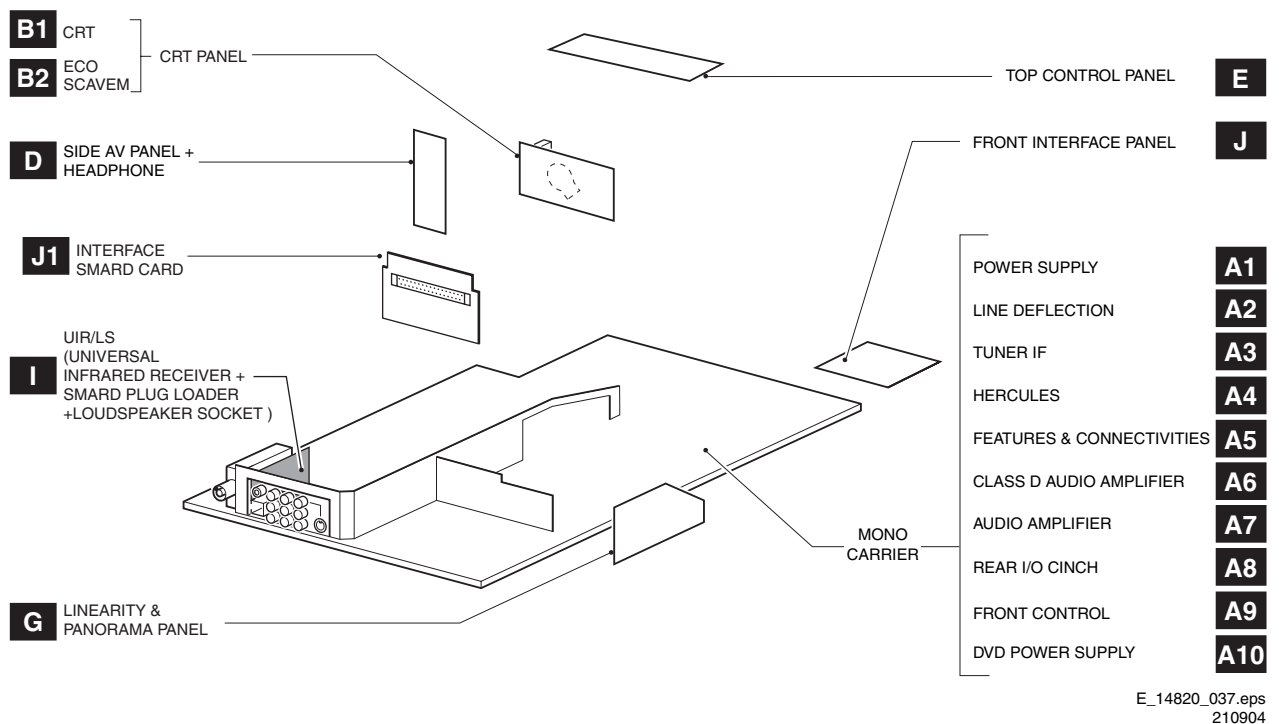


AV2 In (SVHS)

1 - Ground GND
 2 - Ground GND
 3 - Y 1 V_{pp} / 75 ohm
 4 - C 0.3 V_{pp} / 75 ohm



1.3 Chassis Overview



E_14820_037.eps
 210904

Figure 1-3 PWB location

2. Safety Instructions, Warnings, and Notes

2.1 Safety Instructions

Safety regulations require that **during** a repair:

- Connect the set to the Mains (AC Power) via an isolation transformer (> 800 VA).
- Replace safety components, indicated by the symbol , only by components identical to the original ones. Any other component substitution (other than original type) may increase risk of fire or electrical shock hazard.

Safety regulations require that **after** a repair, the set must be returned in its original condition. Pay in particular attention to the following points:

- Route the wire trees correctly and fix them with the mounted cable clamps.
- Check the insulation of the Mains (AC Power) lead for external damage.
- Check the strain relief of the Mains (AC Power) cord for proper function.
- Check the electrical DC resistance between the Mains (AC Power) plug and the secondary side (only for sets which have a Mains (AC Power) isolated power supply):
 1. Unplug the Mains (AC Power) cord and connect a wire between the two pins of the Mains (AC Power) plug.
 2. Set the Mains (AC Power) switch to the "on" position (keep the Mains (AC Power) cord unplugged!).
 3. Measure the resistance value between the pins of the Mains (AC Power) plug and the metal shielding of the tuner or the aerial connection on the set. The reading should be between 4.5 Mohm and 12 Mohm.
 4. Switch "off" the set, and remove the wire between the two pins of the Mains (AC Power) plug.
- Check the cabinet for defects, to avoid touching of any inner parts by the customer.

2.2 Warnings

- In order to prevent damage to ICs and transistors, avoid all high voltage flashovers. In order to prevent damage to the picture tube, use the method shown in Fig. 2-1, to discharge the picture tube. Use a high voltage probe and a multi-meter (position V_{dc}). Discharge until the meter reading is 0 V (after approx. 30 s).

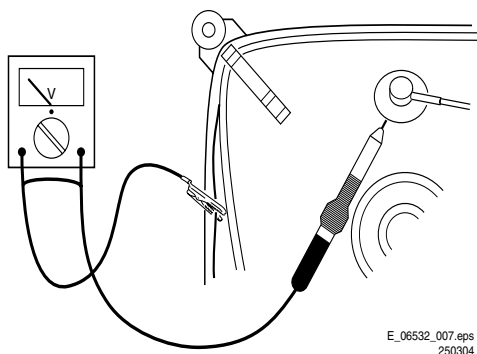


Figure 2-1 Discharge picture tube

- All ICs and many other semiconductors are susceptible to electrostatic discharges (ESD, ). Careless handling during repair can reduce life drastically. Make sure that, during repair, you are connected with the same potential as the mass of the set by a wristband with resistance. Keep components and tools also at this potential. Available ESD protection equipment:

- Complete kit ESD3 (small tablemat, wristband, connection box, extension cable and ground cable) 4822 310 10671.
- Wristband tester 4822 344 13999.
- Together with the deflection unit and any multi-pole unit, flat square picture tubes form an integrated unit. The deflection and the multi-pole units are set optimally at the factory. We do not recommend adjusting this unit during repair.
- Be careful during measurements in the high voltage section and on the picture tube.
- Never replace modules or other components while the unit is 'on'.
- When you align the set, use plastic rather than metal tools. This will prevent any short circuits and the danger of a circuit becoming unstable.

2.3 Notes

2.3.1 General

- Measure the voltages and waveforms with regard to the chassis (= tuner) ground () or hot ground () depending on the tested area of circuitry. The voltages and waveforms shown in the diagrams are indicative. Measure them in the Service Default Mode (see chapter 5) with a colour bar signal and stereo sound (L: 3 kHz, R: 1 kHz unless stated otherwise) and picture carrier at 475.25 MHz for PAL, or 61.25 MHz for NTSC (channel 3).
- Where necessary, measure the waveforms and voltages with () and without () aerial signal. Measure the voltages in the power supply section both in normal operation () and in standby (). These values are indicated by means of the appropriate symbols.
- The semiconductors indicated in the circuit diagram and in the parts lists, are interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.
- Manufactured under license from Dolby Laboratories. "Dolby", "Pro Logic" and the "double-D symbol", are trademarks of Dolby Laboratories.

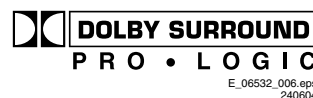


Figure 2-2 Dolby PL Symbol

2.3.2 Schematic Notes

- All resistor values are in ohms and the value multiplier is often used to indicate the decimal point location (e.g. 2K2 indicates 2.2 kohm).
- Resistor values with no multiplier may be indicated with either an "E" or an "R" (e.g. 220E or 220R indicates 220 ohm).
- All capacitor values are given in micro-farads ($\mu = \times 10^{-6}$), nano-farads ($n = \times 10^{-9}$), or pico-farads ($p = \times 10^{-12}$).
- Capacitor values may also use the value multiplier as the decimal point indication (e.g. 2p2 indicates 2.2 pF).
- An "asterisk" (*) indicates component usage varies. Refer to the diversity tables for the correct values.
- The correct component values are listed in the Electrical Replacement Parts List. Therefore, always check this list when there is any doubt.

2.3.3 Rework on BGA (Ball Grid Array) ICs

General

Although (LF)BGA assembly yields are very high, there may still be a requirement for component rework. By rework, we mean the process of removing the component from the PWB and replacing it with a new component. If an (LF)BGA is removed from a PWB, the solder balls of the component are deformed drastically so the removed (LF)BGA has to be discarded.

Device Removal

As is the case with any component that, it is essential when removing an (LF)BGA, the board, tracks, solder lands, or surrounding components are not damaged. To remove an (LF)BGA, the board must be uniformly heated to a temperature close to the reflow soldering temperature. A uniform temperature reduces the chance of warping the PWB. To do this, we recommend that the board is heated until it is certain that all the joints are molten. Then carefully pull the component off the board with a vacuum nozzle. For the appropriate temperature profiles, see the IC data sheet.

Area Preparation

When the component has been removed, the vacant IC area must be cleaned before replacing the (LF)BGA.

Removing an IC often leaves varying amounts of solder on the mounting lands. This excessive solder can be removed with either a solder sucker or solder wick. The remaining flux can be removed with a brush and cleaning agent.

After the board is properly cleaned and inspected, apply flux on the solder lands and on the connection balls of the (LF)BGA.

Note: Do not apply solder paste, as this has shown to result in problems during re-soldering.

Device Replacement

The last step in the repair process is to solder the new component on the board. Ideally, the (LF)BGA should be aligned under a microscope or magnifying glass. If this is not possible, try to align the (LF)BGA with any board markers. To reflow the solder, apply a temperature profile according to the *IC data sheet*. So as not to damage neighbouring components, it may be necessary to reduce some temperatures and times.

More Information

For more information on how to handle BGA devices, visit this URL: www.atyourservice.ce.philips.com (needs subscription, not available for all regions)). After login, select "Magazine", then go to "Workshop Information". Here you will find Information on how to deal with BGA-ICs.

please contact the manufacturer of your soldering equipment.

- Use only adequate solder tools applicable for lead-free soldering tin.
- Adjust your solder tool so that a temperature around 217 - 220 deg. C is reached at the solder joint.
- Do not mix lead-free soldering tin with leaded soldering tin; this will lead to unreliable solder joints!
- Use only original spare parts listed in this manual. These are lead-free parts!
- On the website www.atyourservice.ce.philips.com (needs subscription, not available for all regions) you can find more information on:
 - Aspects of lead-free technology.
 - BGA (de-)soldering, heating-profiles of BGAs used in Philips sets, and others.

2.3.5 Practical Service Precautions

- **It makes sense to avoid exposure to electrical shock.** While some sources are expected to have a possible dangerous impact, others of quite high potential are of limited current and are sometimes held in less regard.
- **Always respect voltages.** While some may not be dangerous in themselves, they can cause unexpected reactions - reactions that are best avoided. Before reaching into a powered TV set, it is best to test the high voltage insulation. It is easy to do, and is a good service precaution.

2.3.4 Lead Free Solder

Some PWBs in this chassis are "lead-free **prepared**". This is indicated on the PWB by the PHILIPS lead-free logo (either by a service-printing or by a sticker). It does not mean that lead-free solder is actually used!

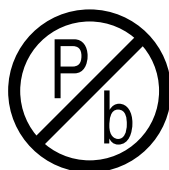


Figure 2-3 Lead-free logo

Due to this fact, some rules have to be respected by the workshop during a repair:

- Use only lead-free soldering tin Philips SAC305 with order code 0622 149 00106. If lead-free solder paste is required,

3. Directions for Use

You can download this information from the following website:

<http://www.philips.com/support>

4. Mechanical Instructions

Index of this chapter:

1. Set Disassembly
2. Service Position
3. Assy/Panel Removal
4. Set Re-assembly

Note: Figures below can deviate slightly from the actual situation, due to different set executions.

4.1 Set Disassembly

Warning: Be sure to disconnect the AC power from the set before opening it.

4.1.1 Rear Cover

1. Remove all fixation screws of the rear cover (**Note:** Do not forget the screws that hold the rear connection panel).
2. Pull the rear cover backwards to remove it.

4.2 Service Position

Before placing the Mono Carrier in its service position, remove the Front Interface Assy/panel (see paragraph "Front Interface Assy/Panel") and the Side AV Assy/panel (see paragraph "Side AV Assy/Panel").

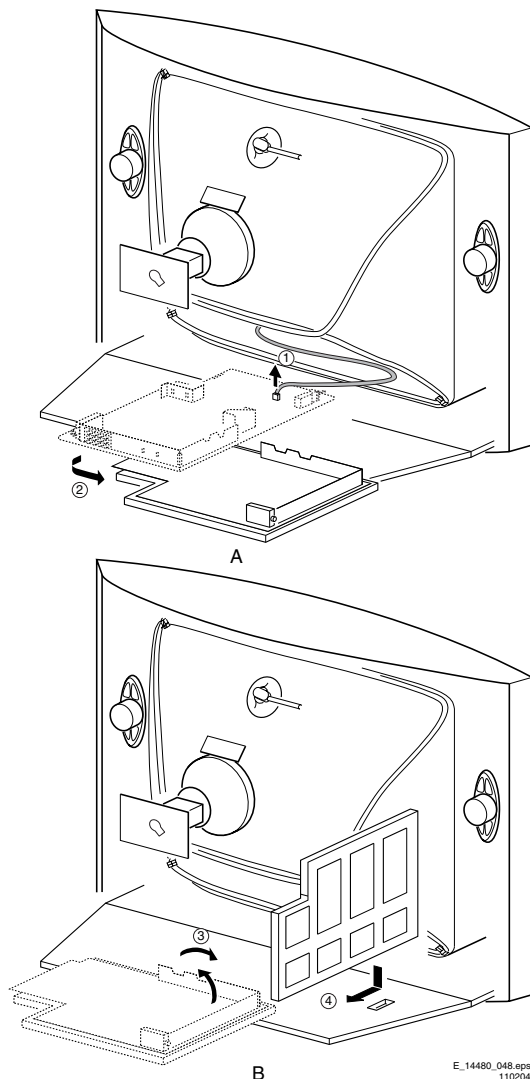


Figure 4-1 Service position Mono Carrier

1. Disconnect the degaussing coil [1].
2. Release the two fixation clamps (at the mid left and mid right side of the bracket), and remove the bracket from the bottom tray, by pulling it backwards [2].
3. Turn the chassis tray 90 degrees counter clockwise.
4. Move the panel bracket somewhat to the left and flip it 90 degrees [3], with the components towards the CRT.
5. Turn the panel bracket with the rear I/O toward the CRT.
6. Place the hook of the tray in the fixation hole of the cabinet bottom [4] and secure it.

4.3 Assy/Panel Removal

4.3.1 Front Interface Assy/Panel

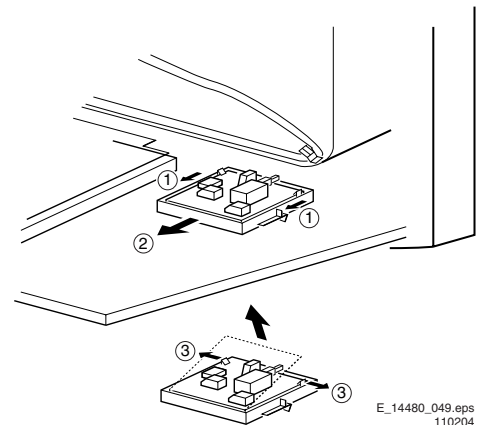


Figure 4-2 Front interface Assy/panel removal

1. Remove the complete module from the bottom plate, by pulling the two fixation clamps upward [1], while sliding the module away from the CRT [2]. **Note:** these clamps are difficult to access.
2. Release the two fixation clamps [3] at the side of the bracket, and lift the panel out of the bracket (it hinges at one side).

4.3.2 Side AV Assy/Panel

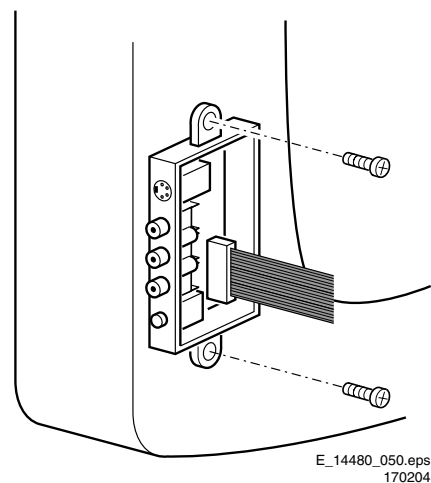


Figure 4-3 Side AV Assy/panel removal

1. Remove the two fixation screws, and remove the complete Side AV assembly.
2. Release the two fixation clamps, and lift the panel out of the bracket.

4.3.3 LTI/CTI Interface Panel

Remove the LTI/CTI Interface panel from the Mono Carrier, by disconnecting it from connector 1212.

4.3.4 Top Control Assy/Panel

1. Remove the two fixation screws.
2. Push the assy a little bit upwards, and then pull it backwards to release it from the front hinge.
3. Lift the panel from its bracket, while releasing the two fixation clamps. The panel hinges on the other side.

4.3.5 Linearity Assy/Panel

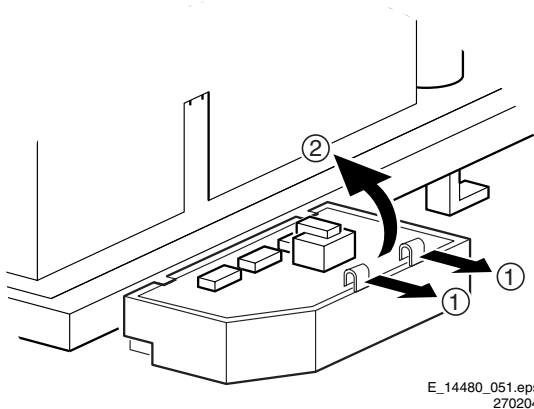


Figure 4-4 Linearity assy/panel removal

1. Release the two fixation clamps [1] to lift the panel out of the bracket [2].

4.3.6 Interface Module Removal

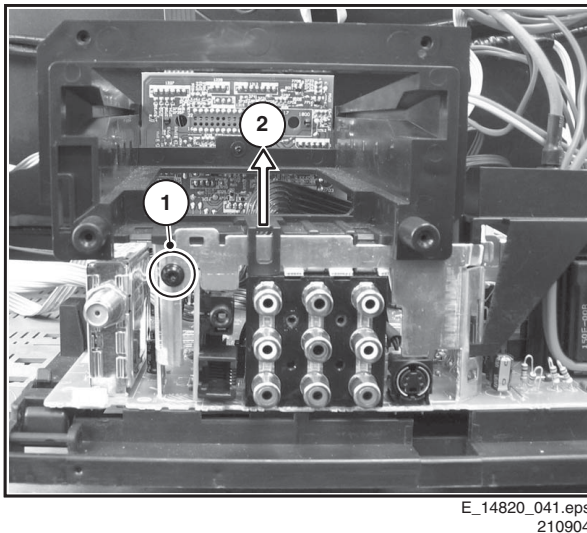


Figure 4-5

1. Unscrew the fixation srew [1].
2. Lift the fixation clamp [2] to release the bracket.

4.3.7 LS/SP Module Removal

Release the connector (1262) on the monocarrier and lift out the module.

4.4 Set Re-assembly

To re-assemble the whole set, do all processes in reverse order.

Note: before you mount the rear cover, perform the following checks:

- Check whether the AC power cord is mounted correctly in its guiding brackets.
- Check whether all cables are replaced in their original position

5. Service Modes, Error Codes, and Fault Finding

Index of this chapter:

1. Test Points
2. Service Modes
3. Problems and Solving Tips (related to CSM)
4. ComPair
5. Error Codes
6. The Blinking LED Procedure
7. Protections
8. Fault Finding and Repair Tips

5.1 Test Points

This chassis is equipped with test points in the service printing. In the schematics test points are identified with a rectangle box around Fxxx or Ixxx. These test points are specifically mentioned in the "Test Point Overview" as "half moons" with a dot in the center.

Table 5-1 Test point overview

Test point	Circuit	Diagr.
F508, F535, F536, F537, F552, F561, F563, F573, F664, I513, I518, I519, I524, I531, I533, I546	Power supply	A1
F401, F412, F413, F414, F418, F452, F453, F455, F456, F458, F459, F460, F461, I408, I416, I417, I420, I462, I468	Line & Frame Deflection	A2
F003, F004, I001, I002	Tuner IF	A3
F201, F203, F205, F206	Hercules	A4
F240, F241, F242	Features & Connectivities	A5
F952, F955, I951, I952	Audio Amplifier	A7
F692	Front Control	A9
F331, F332, F333, F338, F339, F341, F351, F353, F354	CRT Panel	B1
F361, F362, F381, F382	ECO Scavem	B2

Perform measurements under the following conditions:

- Television set in Service Default Alignment Mode.
- Video input: Color bar signal.
- Audio input: 3 kHz left channel, 1 kHz right channel.

5.2 Service Modes

Service Default Alignment Mode (SDAM) offers several features for the service technician, while the Customer Service Mode (CSM) is used for communication between dealer and customer.

5.2.1 Service Default Alignment Mode (SDAM)

Purpose

- To change option settings.
- To create a predefined setting to get the same measurement results as given in this manual.
- To display / clear the error code buffer when leaving SDAM with "standby" key on remote control.
- To override SW protections.
- To perform alignments.
- To start the blinking LED procedure.

Specifications

- Tuning frequency:
 - 61.25 MHz (channel 3)
- Colour system:
 - NTSC
- All picture settings at 50 % (brightness, colour contrast, hue).
- Bass, treble and balance at 50 %; volume at 25 %.
- All service-unfriendly modes (if present) are disabled, like:

- (sleep) timer,
- child/parental lock,
- blue mute,
- hotel/hospitality mode
- auto switch-off (when no IDENT video signal is received for 15 minutes),
- skip / blank of non-favourite presets / channels,
- auto store of personal presets,
- auto user menu time-out.
- Operation hours counter.
- Software version.
- Option settings.
- Error buffer reading and erasing.
- Software alignments.

How to enter SDAM

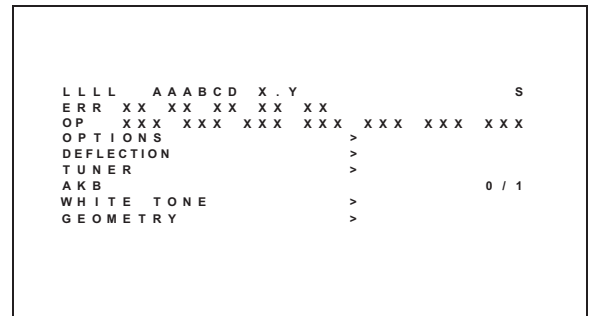
Use one of the following methods:

- Use a System 7 remote control type T374AH (RC-transmitter RG4172BK) and key in the code '062596' directly followed by the 'M' (menu) button or
- Short circuit jumper wires 9252 and 9275 on the mono carrier (see Fig. 8-1) and apply AC power. Then press the power button (remove the short circuit after start-up).

Caution: Entering SDAM by short circuiting wires 9252 and 9275 will override the +8V-protection. Do this only for a short period. When doing this, the service-technician must know exactly what he is doing, as it could lead to damaging the set.

After activating SDAM, the following screen is visible, with S at the upper right side for recognition.

SDAM Menu



E_14820_039.eps
210904

Figure 5-1

1. **LLLL**
This is the operation hours counter. It counts the normal operation hours, not the standby hours.
2. **AAAABC-X.Y**
This is the software identification of the main micro controller:
 - A = the project name (L04H).
 - B = the region: E= Europe, A= Asia Pacific, U= NAFTA, L= LATAM.
 - C = the feature and language
 - X = the main software version number.
 - Y = the sub software version number.
3. **S**
Indication of the actual mode. S= SDAM= Service Default Alignment mode.
4. **Error buffer**
Five errors possible.
5. **Option bytes**
Seven codes possible.
6. **Clear**
Erases the contents of the error buffer. Select the CLEAR

2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys (if necessary) to select BRIGHTNESS.
6. Press the MENU LEFT/RIGHT keys to increase or decrease the BRIGHTNESS value.
7. Use the MENU UP/DOWN keys to select PICTURE.
8. Press the MENU LEFT/RIGHT keys to increase or decrease the PICTURE value.
9. Press the MENU button on the remote control transmitter twice to exit the user menu.
10. The new PERSONAL preference values are automatically stored.

White line around picture elements and text

If:

The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select SHARPNESS.
6. Press the MENU LEFT key to decrease the SHARPNESS value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

Snowy picture

Check CSM line 6. If this line reads "Not Tuned", check the following:

- Antenna not connected. Connect the antenna.
- No antenna signal or bad antenna signal. Connect a proper antenna signal.
- The tuner is faulty (in this case line 2, the Error Buffer line, will contain error number 10). Check the tuner and replace/repair the tuner if necessary.

Black and white picture

If:

- The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select COLOR.
6. Press the MENU RIGHT key to increase the COLOR value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.

8. The new PERSONAL preference value is automatically stored.

Menu text not sharp enough

If:

- The picture improves after you have pressed the AUTO PICTURE button on the remote control transmitter,

Then:

1. Press the AUTO PICTURE button on the remote control transmitter repeatedly (if necessary) to choose PERSONAL picture mode.
2. Press the MENU button on the remote control transmitter. This brings up the normal user menu.
3. In the normal user menu, use the MENU UP/DOWN keys to highlight the PICTURE sub menu.
4. Press the MENU LEFT/RIGHT keys to enter the PICTURE sub menu.
5. Use the MENU UP/DOWN keys to select PICTURE.
6. Press the MENU LEFT key to decrease the PICTURE value.
7. Press the MENU button on the remote control transmitter twice to exit the user menu.
8. The new PERSONAL preference value is automatically stored.

5.4 ComPair

5.4.1 Introduction

ComPair (Computer Aided Repair) is a service tool for Philips Consumer Electronics products. ComPair is a further development on the European DST (service remote control), which allows faster and more accurate diagnostics. ComPair has three big advantages:

- ComPair helps you to quickly get an understanding on how to repair the chassis in a short time by guiding you systematically through the repair procedures.
- ComPair allows very detailed diagnostics (on I²C level) and is therefore capable of accurately indicating problem areas. You do not have to know anything about I²C commands yourself because ComPair takes care of this.
- ComPair speeds up the repair time since it can automatically communicate with the chassis (when the microprocessor is working) and all repair information is directly available. When ComPair is installed together with the SearchMan electronic manual of the defective chassis, schematics and PWBs are only a mouse click away.

5.4.2 Specifications

ComPair consists of a Windows based faultfinding program and an interface box between PC and the (defective) product. The ComPair interface box is connected to the PC via a serial or RS232 cable.

For this chassis, the ComPair interface box and the TV communicate via a bi-directional service cable via the service connector.

The ComPair faultfinding program is able to determine the problem of the defective television. ComPair can gather diagnostic information in two ways:

- Automatic (by communication with the television): ComPair can automatically read out the contents of the entire error buffer. Diagnosis is done on I²C level. ComPair can access the I²C bus of the television. ComPair can send and receive I²C commands to the micro controller of the television. In this way, it is possible for ComPair to communicate (read and write) to devices on the I²C busses of the TV-set.
- Manually (by asking questions to you): Automatic diagnosis is only possible if the micro controller of the

television is working correctly and only to a certain extent. When this is not the case, ComPair will guide you through the faultfinding tree by asking you questions (e.g. *Does the screen give a picture? Click on the correct answer: YES / NO*) and showing you examples (e.g. *Measure test-point I7 and click on the correct oscillogram you see on the oscilloscope*). You can answer by clicking on a link (e.g. text or a waveform picture) that will bring you to the next step in the faultfinding process.

By a combination of automatic diagnostics and an interactive question / answer procedure, ComPair will enable you to find most problems in a fast and effective way.

Beside fault finding, ComPair provides some **additional features** like:

- Up- or downloading of pre-sets.
- Managing of pre-set lists.
- Emulation of the Dealer Service Tool (DST).
- If both ComPair and SearchMan (Electronic Service Manual) are installed, all the schematics and the PWBs of the set are available by clicking on the appropriate hyperlink.

Example: *Measure the DC-voltage on capacitor C2568 (Schematic/Panel) at the Mono-carrier.*

- Click on the “Panel” hyperlink to automatically show the PWB with a highlighted capacitor C2568.
- Click on the “Schematic” hyperlink to automatically show the position of the highlighted capacitor.

5.4.3 How To Connect

1. First, install the ComPair Browser software (see the Quick Reference Card for installation instructions).
2. Connect the RS232 interface cable between a free serial (COM) port of your PC and the PC connector (marked with “PC”) of the ComPair interface.
3. Connect the mains adapter to the supply connector (marked with “POWER 9V DC”) of the ComPair interface.
4. Switch the ComPair interface “OFF”.
5. Switch the television set “OFF” with the mains switch.
6. Connect the ComPair interface cable between the connector on the rear side of the ComPair interface (marked with “I²C”) and the ComPair connector at the rear side of the TV.
7. Plug the mains adapter in a mains outlet, and switch the interface “ON”. The green and red LEDs light up together. The red LED extinguishes after approx. 1 second while the green LED remains lit.
8. Start the ComPair program and read the “Introduction” chapter.

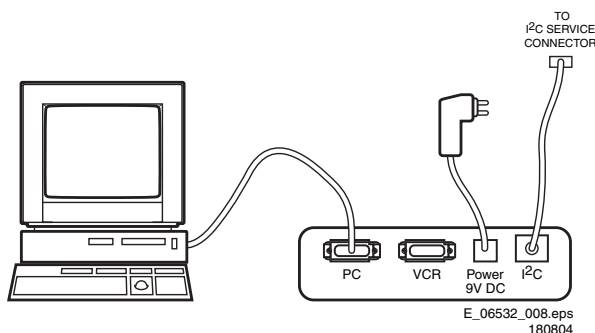


Figure 5-3 ComPair Interface connection

5.4.4 How To Order

ComPair order codes:

- ComPair Software: ST4191.
- ComPair Interface Box: 4822 727 21631.
- AC Adapter: T405-ND.
- ComPair Quick Start Guide: ST4190.

Note: If you encounter any problems, contact your local support desk.

5.5 Error Codes

The error code buffer contains all errors detected since the last time the buffer was erased. The buffer is written from left to right. When an error occurs that is not yet in the error code buffer, it is displayed at the left side and all other errors shift one position to the right.

5.5.1 How To Read The Error Buffer

You can read the error buffer in 3 ways:

- On screen via the SAM (if you have a picture).

Examples:

- ERROR: 0 0 0 0 0 : No errors detected
- ERROR: 6 0 0 0 0 : Error code 6 is the last and only detected error
- ERROR: 9 6 0 0 0 : Error code 6 was detected first and error code 9 is the last detected (newest) error

- Via the blinking LED procedure (when you have no picture). See “The Blinking LED Procedure”.
- Via ComPair.

5.5.2 How To Clear The Error Buffer

The error code buffer is cleared in the following cases:

- By using the CLEAR command in the SAM menu:
 - To enter SAM, press the following key sequence on the remote control transmitter: “062596” directly followed by the OSD/STATUS button (do not allow the display to time out between entries while keying the sequence).
 - Make sure the menu item CLEAR is highlighted. Use the MENU UP/DOWN buttons, if necessary.
 - Press the MENU RIGHT button to clear the error buffer. The text on the right side of the “CLEAR” line will change from “CLEAR?” to “CLEARED”
- If the contents of the error buffer have not changed for 50 hours, the error buffer resets automatically.

Note: If you exit SAM by disconnecting the AC power from the television set, the error buffer is not reset.

5.5.3 Error Codes

In case of non-intermittent faults, write down the errors present in the error buffer and clear the error buffer before you begin the repair. This ensures that old error codes are no longer present.

If possible, check the entire contents of the error buffer. In some situations, an error code is only the result of another error and not the actual cause of the problem (for example, a fault in the protection detection circuitry can also lead to a protection).

Table 5-2 Error code overview

Error	Device	Error description	Check item	Diagram
0	Not applicable	No Error		
1	Not applicable	X-Ray/Over-voltage protection (US only)	2411, 2412, 2413, 6404, 6411, 6412	A2
2	Not applicable	High beam (BCI) protection	3404, 7405	A2
3	Not applicable	Vertical guard protection	3466, 7451, 7452, 7453, 7454	A2
4	Tuner	I2C error while communicating with 2nd tuner	1000, 5010, (PIP Module)	F2
5	Not applicable	+5v protection	7604, 7605	A5
6	I2C bus	General I2C error	7200, 3207, 3214	A4
7	Not applicable	-	-	-
8	Not applicable	-	-	-
9	24C16	I2C error while communicating with the EEPROM	7601, 3604, 3605	A5
10	Tuner	I2C error while communicating with the PLL tuner	1000, 5001	A3
11	TDA6107/A	Black current loop instability protection	7330, 3351, CRT	B1
12	SDA9488X	I2C error while communicating with the PIP processor	7242 (PIP Module)	F1
13	Not applicable	-	-	-
14	DVD Loader	I2C error while communicating with the DVD Interface module	DVD Interface module	DVD Loader
15	TDA9178T/N1	I2C error while communicating with LTI module	7610	H
16	TDA9887	I2C error while communicating with PIP_Demodulator	7201	F2
17	Not applicable	-	-	-
18	Not applicable	-	-	-
19	TDA1200x	I2C error while communicating with SSD stereo sound decoder	7200	A4
20	TDA1200x	I2C error while communicating with video cosmic in Hercules IC	7200	A4

5.6 The Blinking LED Procedure

Using this procedure, you can make the contents of the error buffer visible via the front LED. This is especially useful when there is no picture.

When the SDM is entered, the front LED will blink the contents of the error-buffer:

- When all the error-codes are displayed, the sequence finishes with a LED blink of 1.5 seconds,
- The sequence starts again.

Example of error buffer: **12 9 6 0 0**

After entering SDM, the following occurs:

- 1 long blink of 5 seconds to start the sequence,
- 12 short blinks followed by a pause of 1.5 seconds,
- 9 short blinks followed by a pause of 1.5 seconds,
- 6 short blinks followed by a pause of 1.5 seconds,
- 1 long blink of 1.5 seconds to finish the sequence,
- The sequence starts again at 12 short blinks.

5.7 Protections

If a fault situation is detected, an error code will be generated; and, if necessary, the television set will go into protection mode. Blinking of the red LED at a frequency of 3 Hz indicates the protection mode. In some error cases, the microprocessor does not put the set in protection mode. The error codes of the error buffer and the blinking LED procedure can be read via the Service Default Menu (SDM), or via ComPair.

To get a quick diagnosis the chassis has three service modes implemented:

- The Customer Service Mode (CSM).
- The Service Default Mode (SDM).
- The Service Alignment Mode (SAM).

For a detailed mode description, see the relevant sections.

5.8 Fault Finding and Repair Tips

Notes:

- It is assumed that the components are mounted correctly with correct values and no bad solder joints.
- Before any fault finding actions, check if the correct options are set.

5.8.1 NVM Editor

In some cases, it can be handy if one directly can change the NVM contents. This can be done with the “NVM Editor” in SAM mode.

5.8.2 Power Supply

Set Not Working

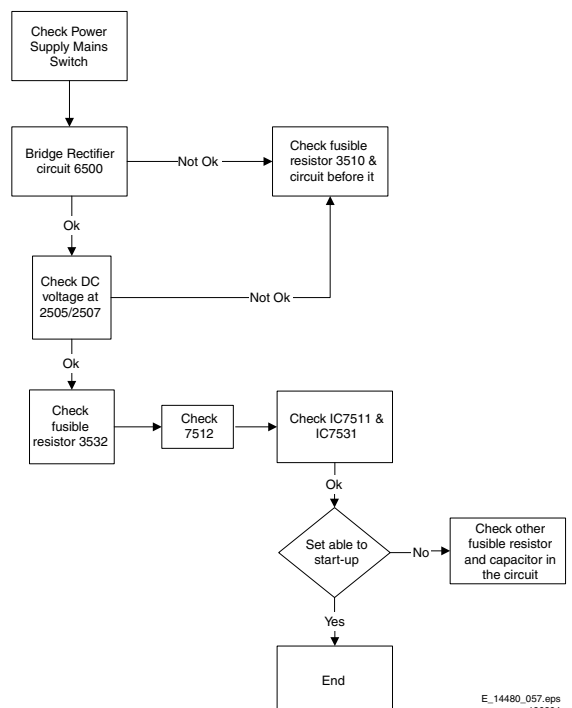


Figure 5-4 Fault finding tree “Set not working”

Set Does Not Start Up

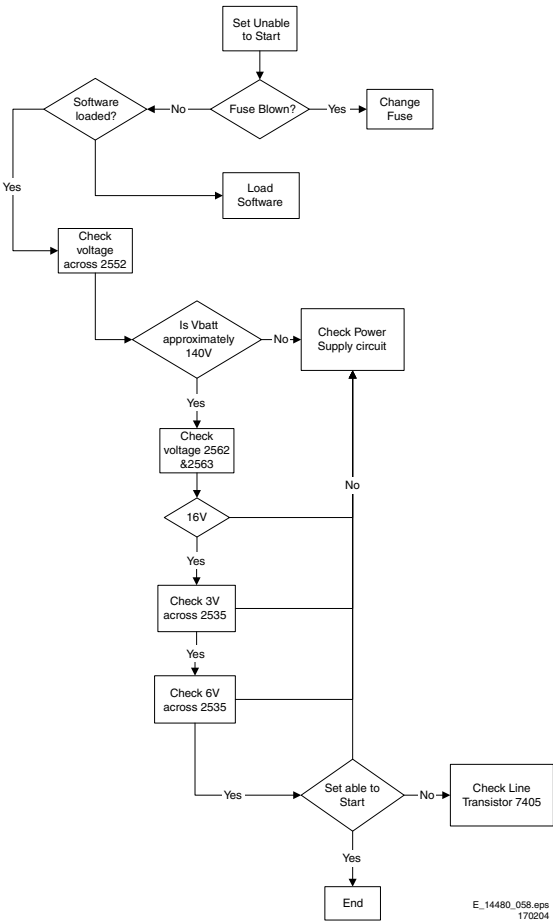


Figure 5-5 Fault finding tree “Set does not start up”

5.8.3 Deflection

One Thin Vertical Line

- Quick check:
- Set in protection mode.
 - LED blinking with error “3”.

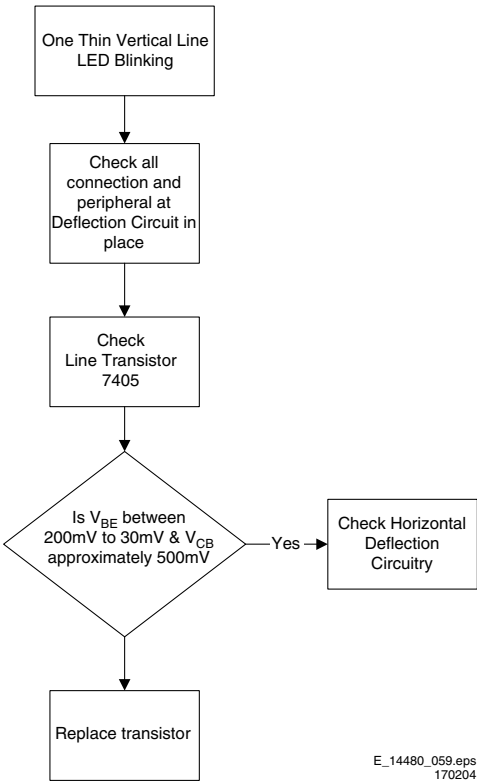


Figure 5-6 Fault finding tree “One thin vertical line”

One Thin Horizontal Line

- Quick check:
- Set in protection mode.
 - LED blinking with error “2”.

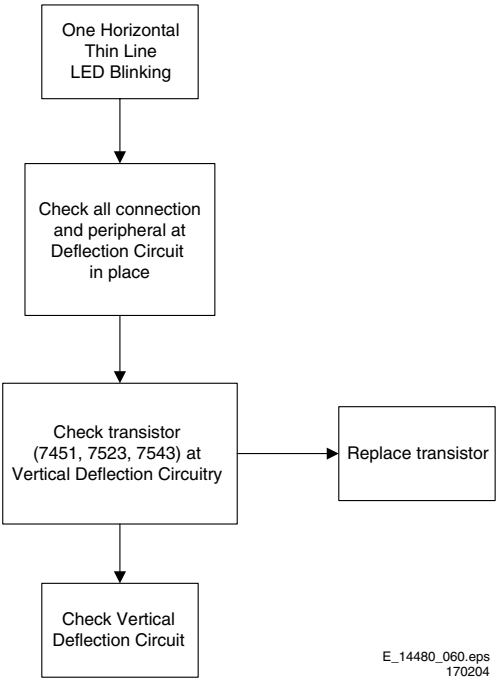


Figure 5-7 Fault finding tree “One thin horizontal line”

Blank Screen

5.8.5 Tuner and IF

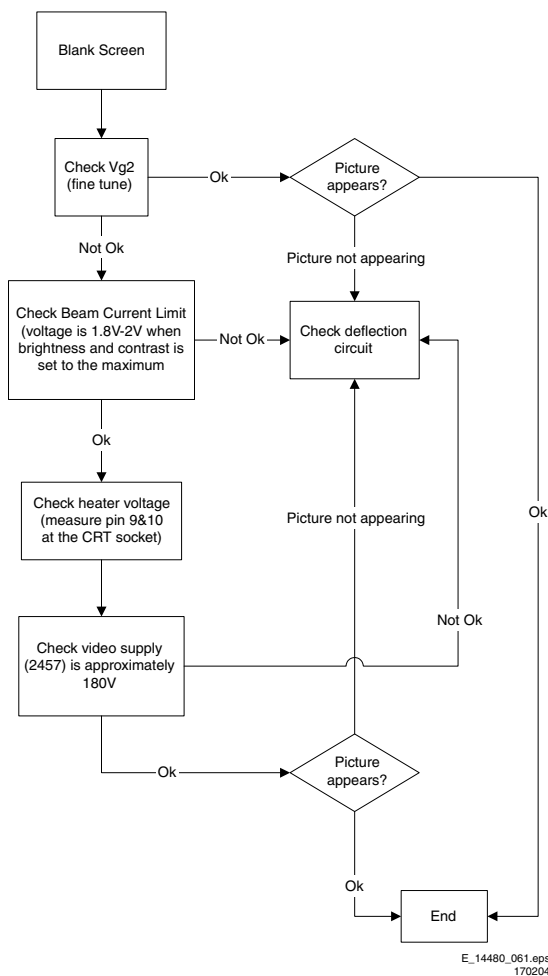


Figure 5-8 Fault finding tree "Blank screen"

5.8.4 Source Selection

Set is not able to go into AV or any missing AV is encountered

E.g. AV1 is available but not able to enter to AV1: Check if the option setting is correct.

Set is able to go to AV, but no audio is heard.

1. Check that continuity of signal is there from the SCART/ Cinch input to the input of the Hercules.
2. If continuity is there and still no audio, check that option settings are correct.
3. If logic setting is correct and still no audio, proceed to Audio Decoder/Processor troubleshooting section.

Set is able to go into AV but no video is available:

1. Check continuity from AV input to HERCULES depending on the input.
2. If continuity is available and yet no video, proceed to Video Processor troubleshooting section.

No Picture

1. Check that the Option settings are correct.
2. If correct, check that supply voltages are there.
3. If supply voltages are present, check whether picture is present in AV.
4. If picture is present in AV, check with the scope the Tuner IF output signal by manual storage to a known channel.
5. If IF output is present, Tuner is working fine. If no IF output, I2C data lines may be open, check continuity of I2C lines. If I2C lines are ok, Tuner may be defect, replaced Tuner.
6. If Tuner IF is present and yet still no picture in RF mode, go to Video Processing troubleshooting section.

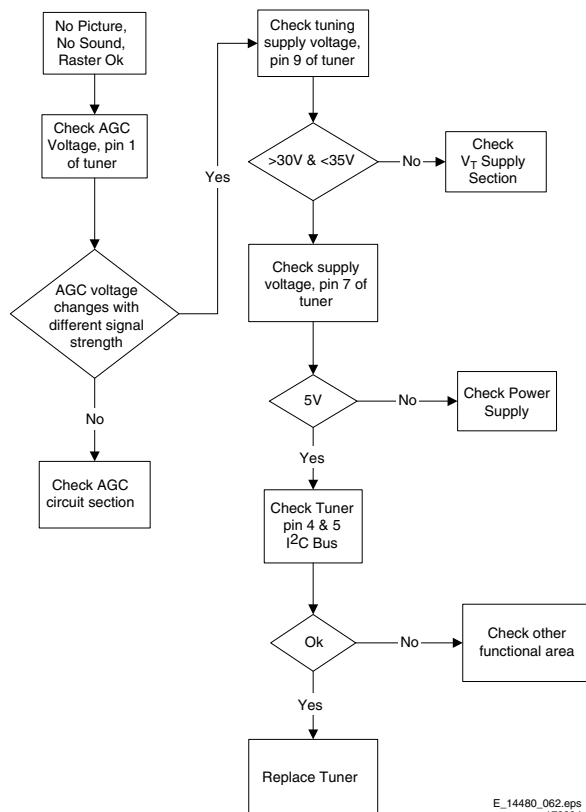
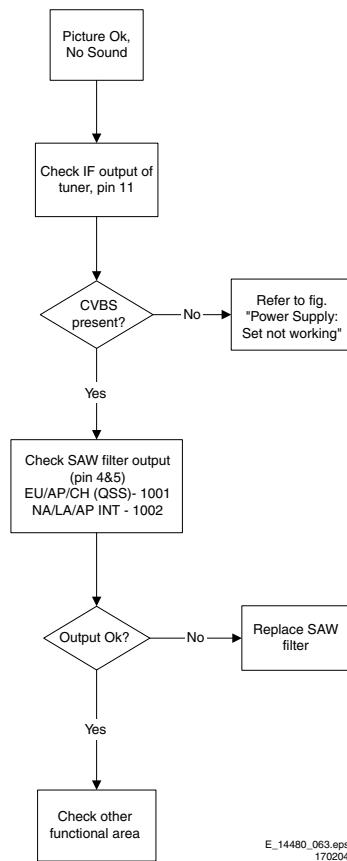
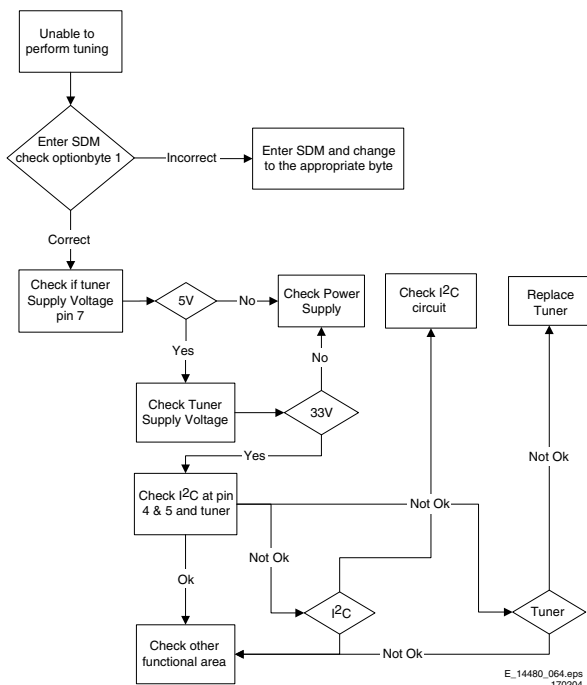
No Picture, No Sound

Figure 5-9 Fault finding tree "No picture, no sound"

Picture Ok, No Sound**Figure 5-10** Fault finding tree “Picture ok, no sound”**Unable To Perform Tuning****Figure 5-11** Fault finding tree “Unable to perform tuning”**5.8.6 Controller**

Below are some guidelines for troubleshooting of the Micro Controller function. Normally Micro Controller should be checked when there is a problem of startup.

1. Check that both +3.3 V_{dc} and +1.8 V_{dc} are present.
2. Check that crystal oscillator is working.
3. Check that Power Good signal is at “high” logic, normal operation.
4. Check that HERCULES is not in standby mode. Pin 15 of HERCULES should be 0 V_{dc}.
5. Make sure H-drive pulse is there. This can be checked at resistor R3239. If H-drive does not exist, remove resistor R3239 to check if there is loading.

Note: When the set shuts down after a few second after power “on”, the main cause is that Vg2 not aligned properly, try adjusting Vg2 during the few seconds of power “on”.

5.8.7 Video Processing**No Picture**

When “no picture in RF”, first check if the microprocessor is functioning ok in section “Controller”. If that is ok, follow the next steps.

When “no picture in AV”, first check if the video source selection is functioning ok in section “Source Selection”. If that is ok, follow the next steps.

1. Check that normal operating conditions are met.
2. Check that there is video signal at pin 81. If no video, demodulator part of the HERCULES is faulty, replace with new HERCULES.
3. If video signal is available at pin 81, check pin 56, 57, and 58 for the RGB signal.
4. If signal is not available, try checking the BRIGHTNESS and/or CONTRAST control, and make sure it is not at zero.
5. If still with the correct settings and no video is available, proceed to the CRT/RGB amplifier diagram.

For sets with TDA9178, follow steps below:

1. Put Option Byte 2 bit 4 to “0”; if video signal is not available, then check fault finding section “Controller”, Section “Source Selection”, and steps above.
2. If video is available but not correct, put Option Byte 2 bit 4 to “1”, then check if LTI panel is present. If not, put LTI panel in the main chassis (connector 1221).
3. If LTI panel is in main chassis, check cable between LTI panel and main chassis (position is 1206). If it is connected, then the LTI panel is faulty, replace it.

For sets with Scavem, and Scavem does not work, follow steps below:

1. Check Scavem coil connector (position is 1361) if connected; if not, connect it.
2. If connected, check NVM “bit storage” byte 1 bit 7; if it is not “1”, set it to “1”.
3. If it is “1”, then check the data of the NVM addresses as in the next table. If the data is not correct, then set these addresses to diagram values.
4. If it still not works, track Scavem output from pin64 of HERCULES to CRT panel.

Table 5-3 NVM default values for Scavem

Description	Address (dec)	Address (hex)	Value (hex)
SPR, WS	140	8C	00
VMA, SVM	141	8D	32
NVM_SOC_SMD	142	8E	03

5.8.8 Audio Processing

No Sound

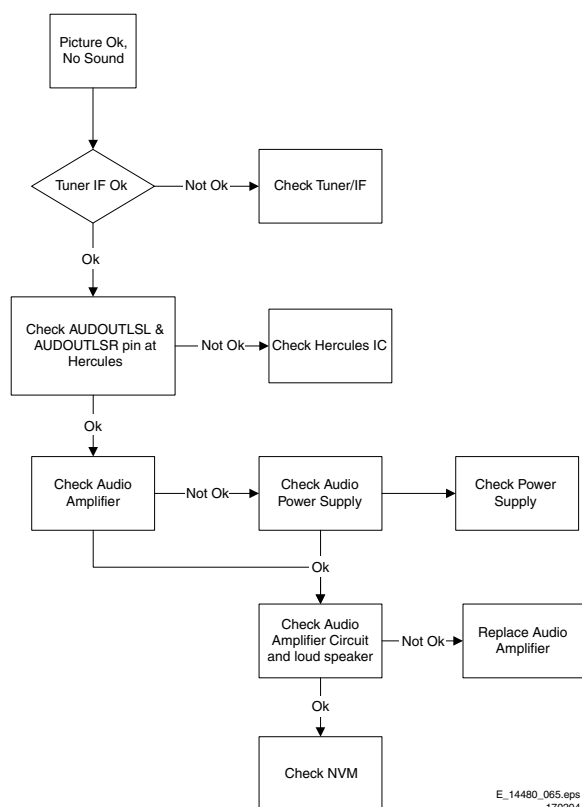


Figure 5-12 Fault finding tree “No sound”

No RF audio for QSS/Inter-Carrier stereo sets.

1. Check pin 99 and 100 for SIF signal (for QSS) or pin 104 and 105 for video with SIF (for Inter-Carrier)
2. If signal is not present, check for the QSS/FMI bit settings. Check also the NVM data.
3. If signals are present and still no audio, check the audio supply voltage +8V are present.
4. If still no audio signal at Hercules output, Hercules is faulty.

No AV audio.

1. Check troubleshooting methods in section “Source Selection”.
2. Check the output of the Hercules to see if there is signal available. If no, check the normal operating condition and also the NVM data.
3. If still no audio signal at Hercules output, Hercules is faulty.

Note: If there is audio signal at Hercules output and no audio at loudspeaker, proceed to Audio Amplifier troubleshooting methods.

5.8.9 Audio Amplifier

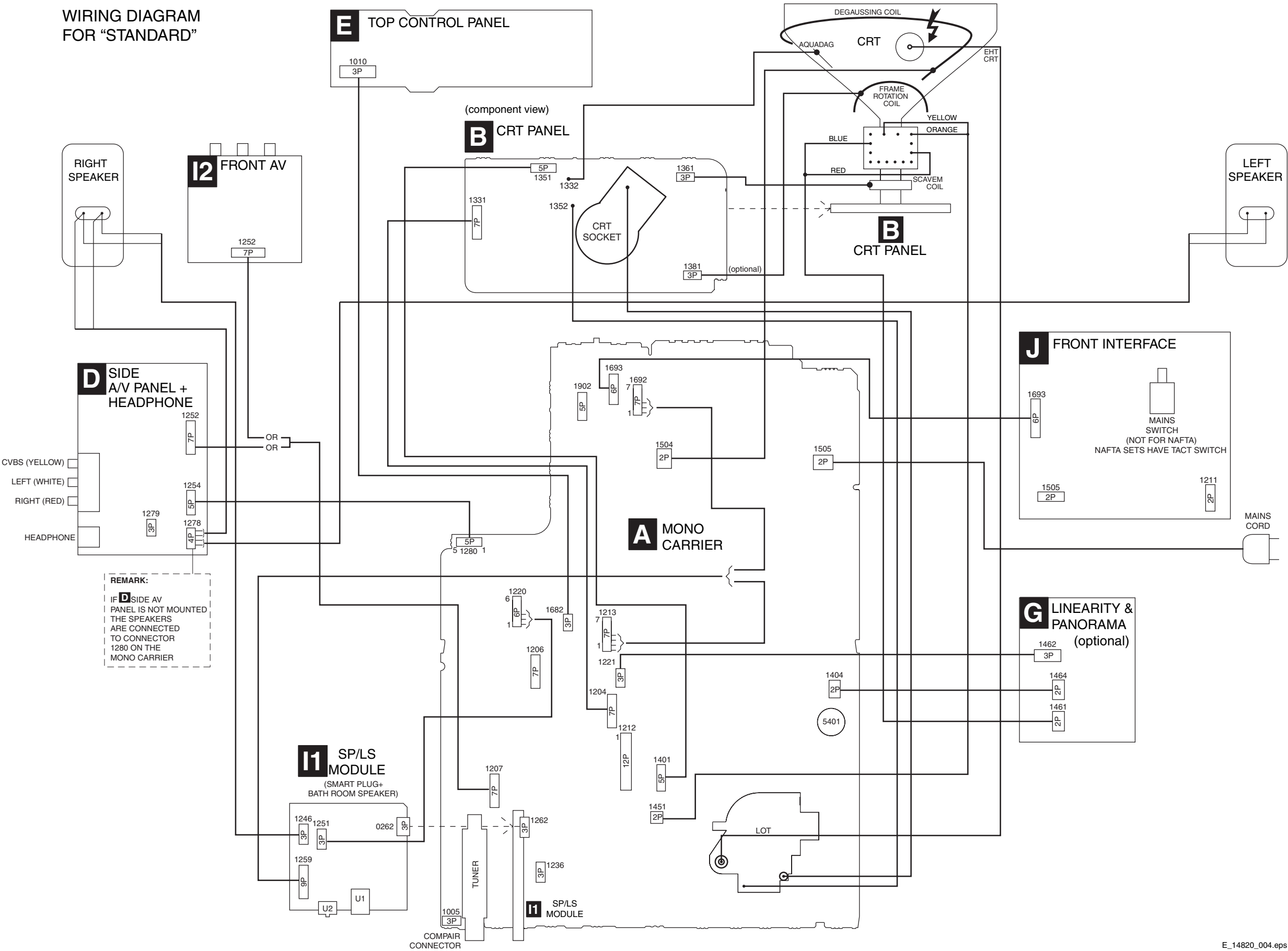
No RF as well as AV audio at the loudspeaker:

1. Check that the normal operation condition of the amplifier is met.
2. If normal operation conditions are met, check the continuity from Hercules output to input of the amplifier.
3. If continuity is there and still no audio, check speaker wire connections. If still no audio, amplifier IC might be faulty

Personal Notes:

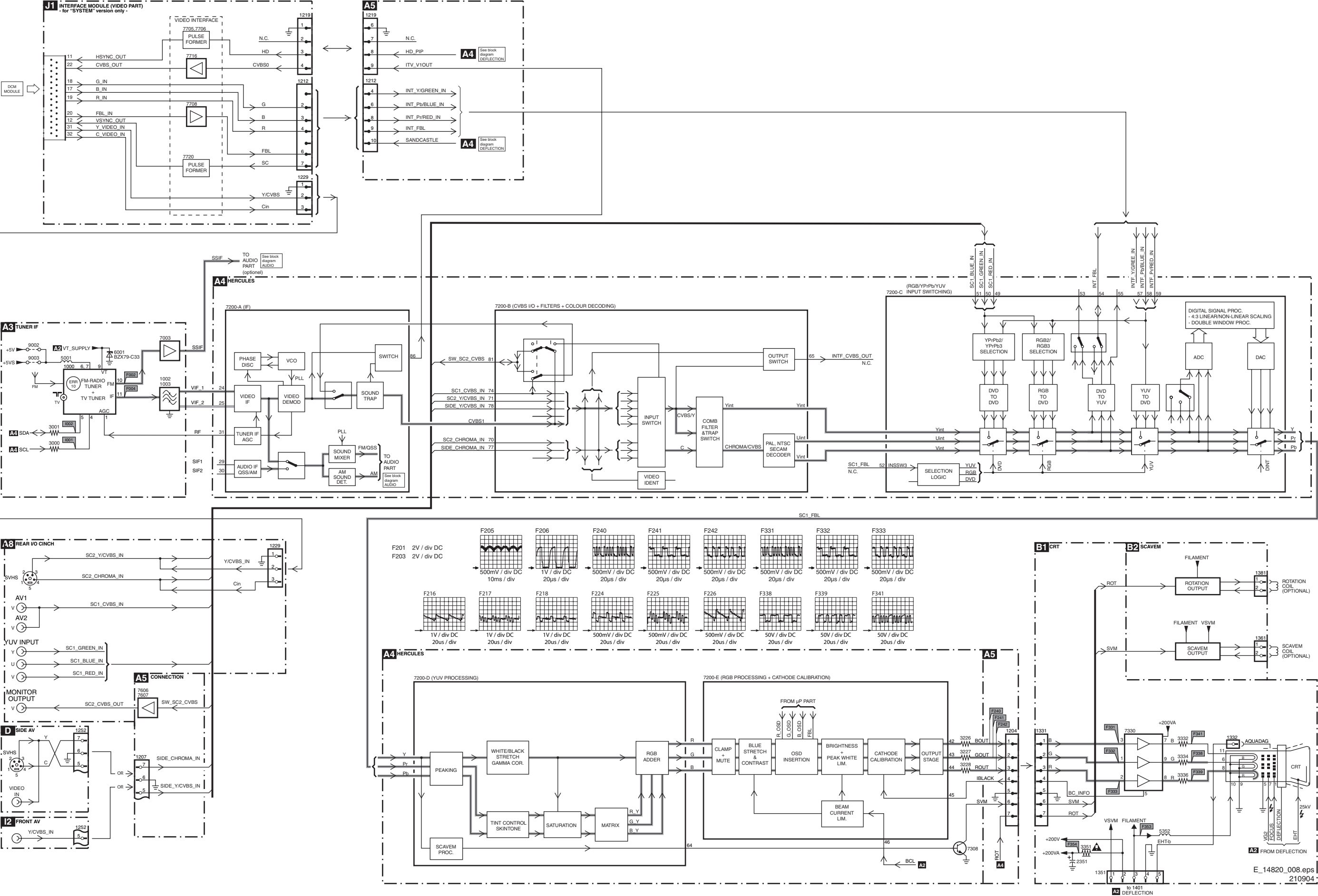
6. Block Diagrams, Testpoint Overviews, and Waveforms

Wiring Diagram Standard

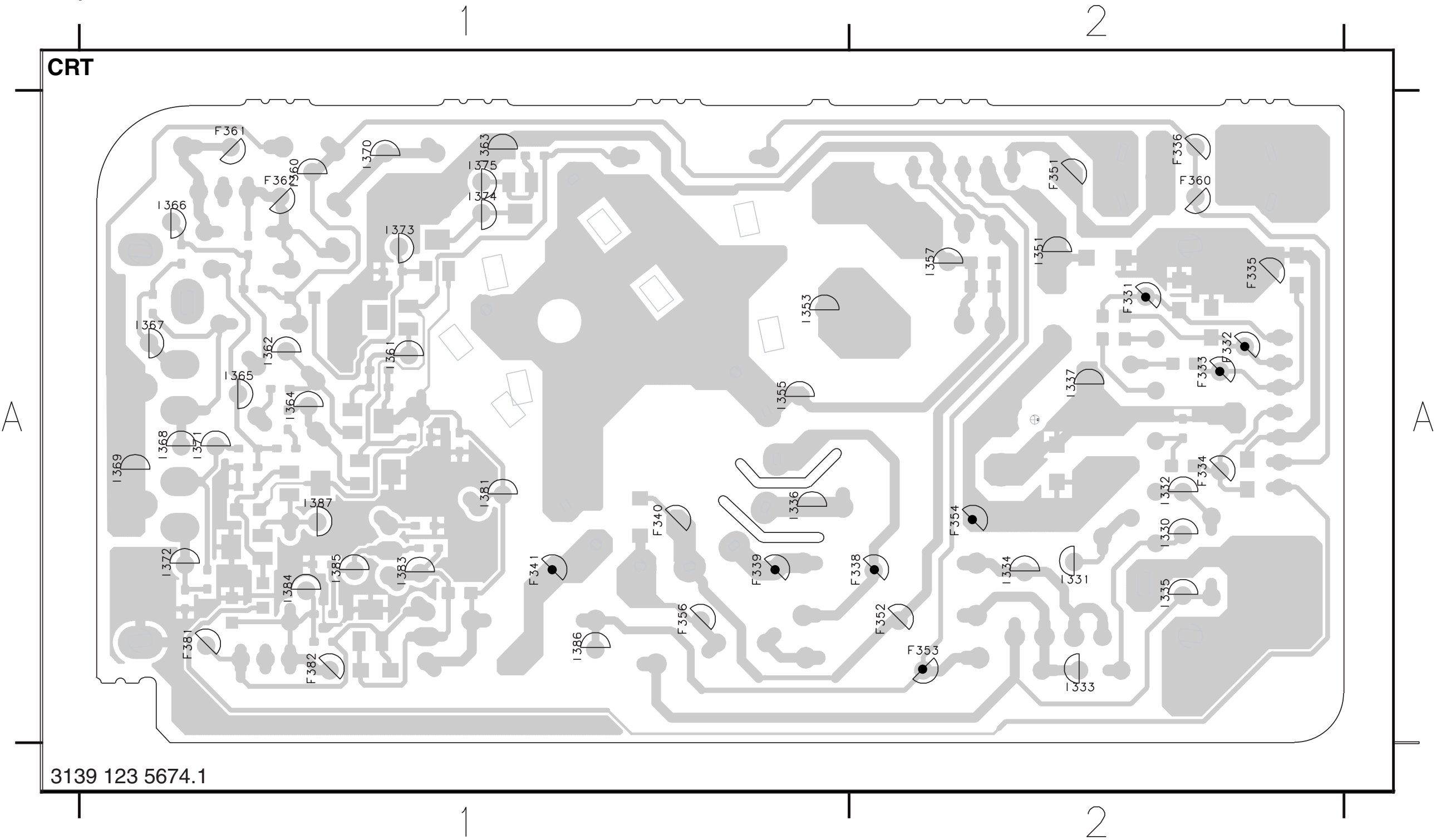


Block Diagram Video

VIDEO

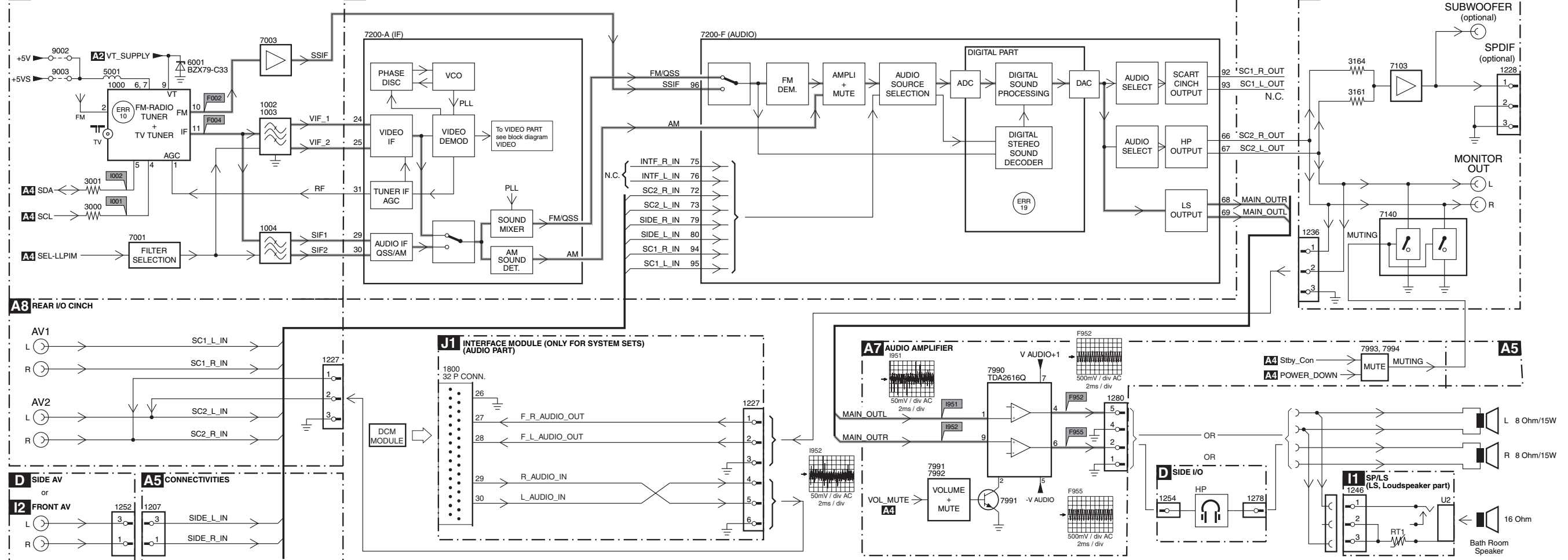


Testpoint Overview CRT Panel

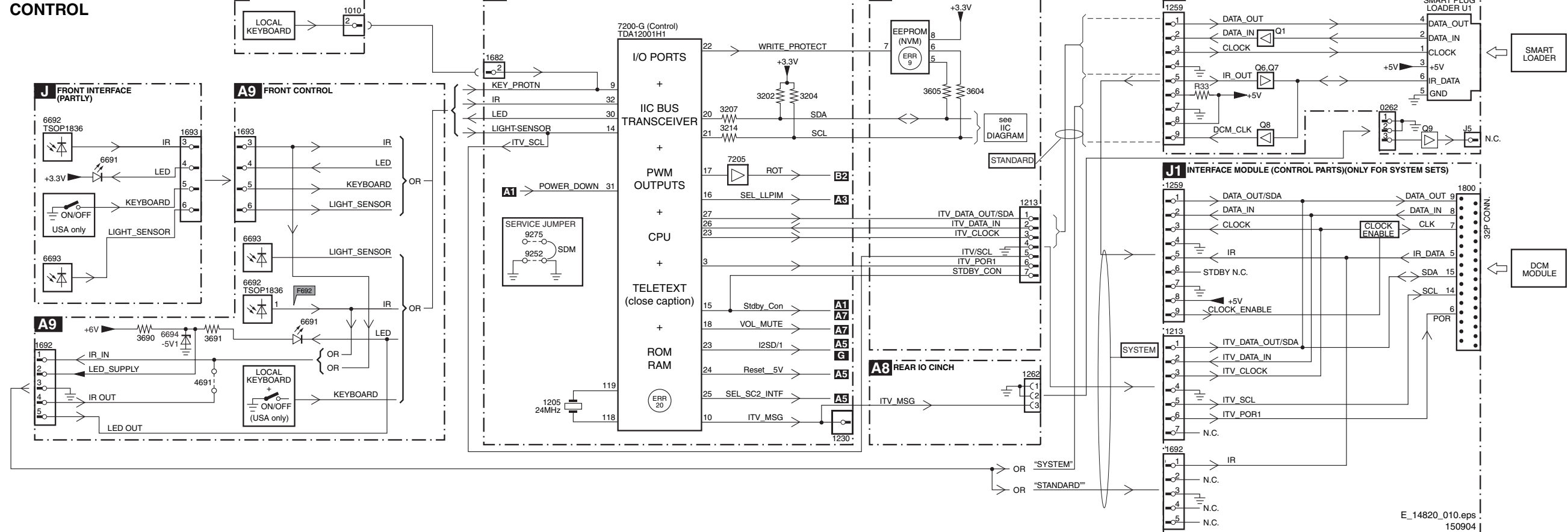


- F331 A2
- F332 A2
- F333 A2
- F334 A2
- F335 A2
- F336 A2
- F338 A2
- F339 A1
- F340 A1
- F341 A1
- F351 A2
- F352 A2
- F353 A2
- F354 A2
- F356 A1
- F360 A2
- F361 A1
- F362 A1
- F381 A1
- F382 A1
- I330 A2
- I331 A2
- I332 A2
- I333 A2
- I334 A2
- I335 A2
- I336 A1
- I337 A2
- I351 A2
- I353 A1
- I355 A1
- I357 A2
- I360 A1
- I361 A1
- I362 A1
- I363 A1
- I364 A1
- I365 A1
- I366 A1
- I367 A1
- I368 A1
- I369 A1
- I370 A1
- I371 A1
- I372 A1
- I373 A1
- I374 A1
- I375 A1
- I381 A1
- I383 A1
- I384 A1
- I385 A1
- I386 A1
- I387 A1

A3 TUNER IF

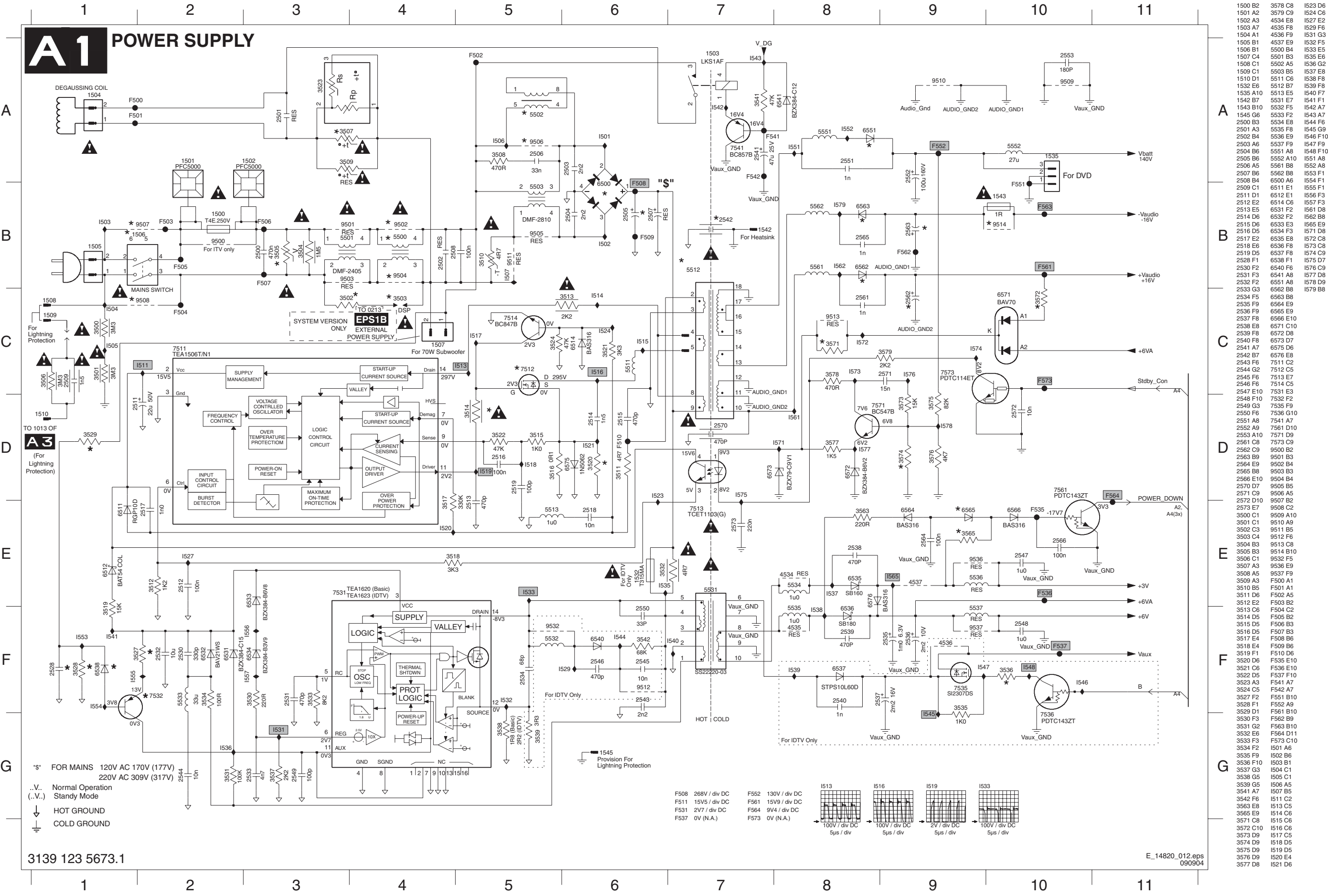


E TOP CONTROL



7. Circuit Diagrams and PWB Layouts

Mono Carrier: Power Supply



Mono Carrier: Diversity Table for A1 (Power Supply)

1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	----

DIVERSITY TABLE FOR A1 POWER SUPPLY

REGION	NAFTA			LATAM / AP						CHINA			INDIA		EUROPE					
MAIN RANGE	LR			FR						HR			HR		HR					
SET	27RF 27FSQ	32RF	26WSRF 30WSRF 32FSQ	21RF	25RF 29FSQ	29RF	29RF	28WSSF	28WSRF 32WSRF	21/25RF	29RF	34RF	21/29RF	21/29RF 29FSQ	21RF	29RF 28WSSF	29RF	24WR 25/28BLD	28WSRF	32WSRF
VBATT	130V	130V	143V	130V	130V	130V	130V	143V	143V	130V	130V	130V	130V	130V	130V	130V	130V	143V	143V	143V
AUDIO OUTPUT	2X5W 2X10W	2X5W 2X10W	2X5W 2X10W	2X10W	2X5W 2X10W	2X5W	2X10W	2X5W	2X10W	2X10W	2X5W 2X10W	2X10W	2X5W 2X10+20W	2X15W	2X5W 2X10W	2X5W	2X10W	2X5W 2X10W	2X5W 2X10W	2X5W 2X10W
1508	---	---	---	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK	WIRE SIN 180 SIN 18ST BK
1510	---	---	---	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK	WIRE SIN 400 SIN 18ST BK
2505	200V 470U	200V 470U	200V 470U	400V 330U	400V 330U	400V 330U	400V 330U	400V 330U	400V 330U	450V 220U	450V 220U	450V 220U	450V 220U	450V 220U	400V 220U	400V 220U	400V 220U	400V 220U	400V 220U	400V 220U
2506	---	---	---	---	---	---	---	---	---	---	400V 33N	400V 33N	---	---	---	---	---	---	---	---
2508	---	---	---	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N	275V 100N
2509	---	---	---	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5	250V 1N5
2528	---	---	---	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N	470N
2542	250V 1N5	250V 1N5	250V 1N5	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N	250V 1N
2570	---	---	---	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P	250V 470P
3505	1MA/423V	1MA/423V	1MA/423V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V	1MA/612V
3506	---	---	---	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3	3M3
3507	---	144V 3R	144V 3R	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
3508	---	---	---	---	---	---	---	---	---	---	470R	470R	---	---	---	---	470R	---	470R	470R
3514	100R	100R	100R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R	47R
3520	0R18	0R18	0R18	0R33	0R33	0R33	0R22	0R33	0R22	0R33	0R33	0R33	0R33	0R33	0R33	0R33	0R33	0R33	0R33	0R33
3527	---	---	---	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K	47K
3528	---	---	---	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M	1M
3529	---	---	---	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2	2M2
3523	145V 1R5	---	---	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5	276V 4R5
3565	15K	15K	15K	18K	18K	18K	18K	18K	18K	15K	15K	15K	15K	15K	15K	15K	15K	15K	15K	15K
3574	150K	150K	33K	150K	150K	150K	150K	33K	33K	150K	150K	150K	150K	150K	150K	150K	33K	33K	33K	33K
5500	---	---	---	10MH 2A	10MH 2A	10MH 2A	10MH 2A	10MH 2A	10MH 2A	20MH 1A5	20MH 1A5	20MH 1A5	---	---	20MH 1A5	20MH 1A5	20MH 1A5	20MH 1A5	20MH 1A5	20MH 1A5
5502	---	---	---	---	---	---	---	---	---	---	65MH	65MH	---	---	---	---	65MH	---	65MH	38MH
5512	SS40310-01	SS40310-01	SS40312-01	SS42315-01	SS42315-01	SS42315-01	SS49309-01	SS42316-01	SS49308-01	SS42315-01	SS42315-01	SS42315-01	SS42315-01	SS42317-01	SS42315-01	SS42315-01	SS42315-01	SS42316-01	SS42316-01	SS42316-01
6500	GBU4JL	GBU6JL	GBU6JL	GBU4JL	GBU4JL	GBU6JL	GBU6JL	GBU6JL	GBU6JL	GBU4JL	GBU4JL	BYV29X-500	GBU4JL	GBU4JL	GBU4JL	GBU4JL	GBU4JL	GBU4JL	GBU4JL	GBU4JL
6538	---	---	---	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316	BAS316
6551	STTH8L06D	BYV29X-500	BYV29X-500	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	STTH8L06D	BYV29X-500
6565	UDZS9.1B	UDZS9.1B	UDZS9.1B	UDZS7.5B	UDZS7.5B	UDZS7.5B	UDZS7.5B	UDZS7.5B	UDZS7.5B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B	UDZS10B
7512	FQPF9N50	FQPF9N50	FQPF9N50	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80	FQPF7N80
7532	---	---	---	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B	BC857B
9502	JMP	JMP	JMP	---	---	---	---	---	---	---	---	---	JMP	JMP	---	---	---	---	---	---
9504	JMP	JMP	JMP	---	---	---	---	---	---	---	---	---	JMP	JMP	---	---	---	---	---	---
9506	JMP	JMP	JMP	JMP	JMP	JMP	JMP	JMP	JMP	JMP	---	---	JMP	JMP	JMP	JMP	---	JMP	---	---

AUDIO OUTPUT	2X5W	2X10W	2X10+20W	2X15W
1543	---	---	2A 250V	2A250V
2562	25V 1000uF	25V 2200uF	25V 2200uF	25V 2200uF
2563	25V 1000uF	25V 2200uF	25V 2200uF	25V 2200uF
3571	220R	220R	220R	680R
3572	220R	220R	220R	470R
6562	SB360	SB360	SB360	SB380
6563	SB360	SB360	SB360	SB380
9514	JMP	JMP	---	---

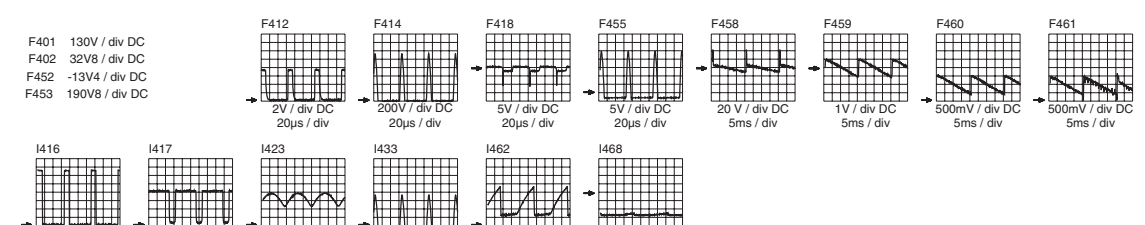
REGION	NAFTA	ROW
1506	---	Main Switch
9507	JMP	---
9508	JMP	---

3139 123 5673.1

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140604

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---	---	---	---	---	---	---	---	---	----

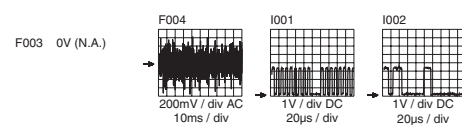
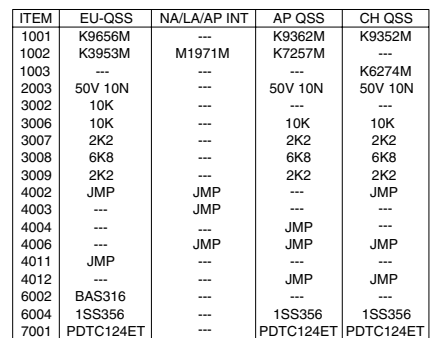
A2 LINE + FRAME DEFLECTION



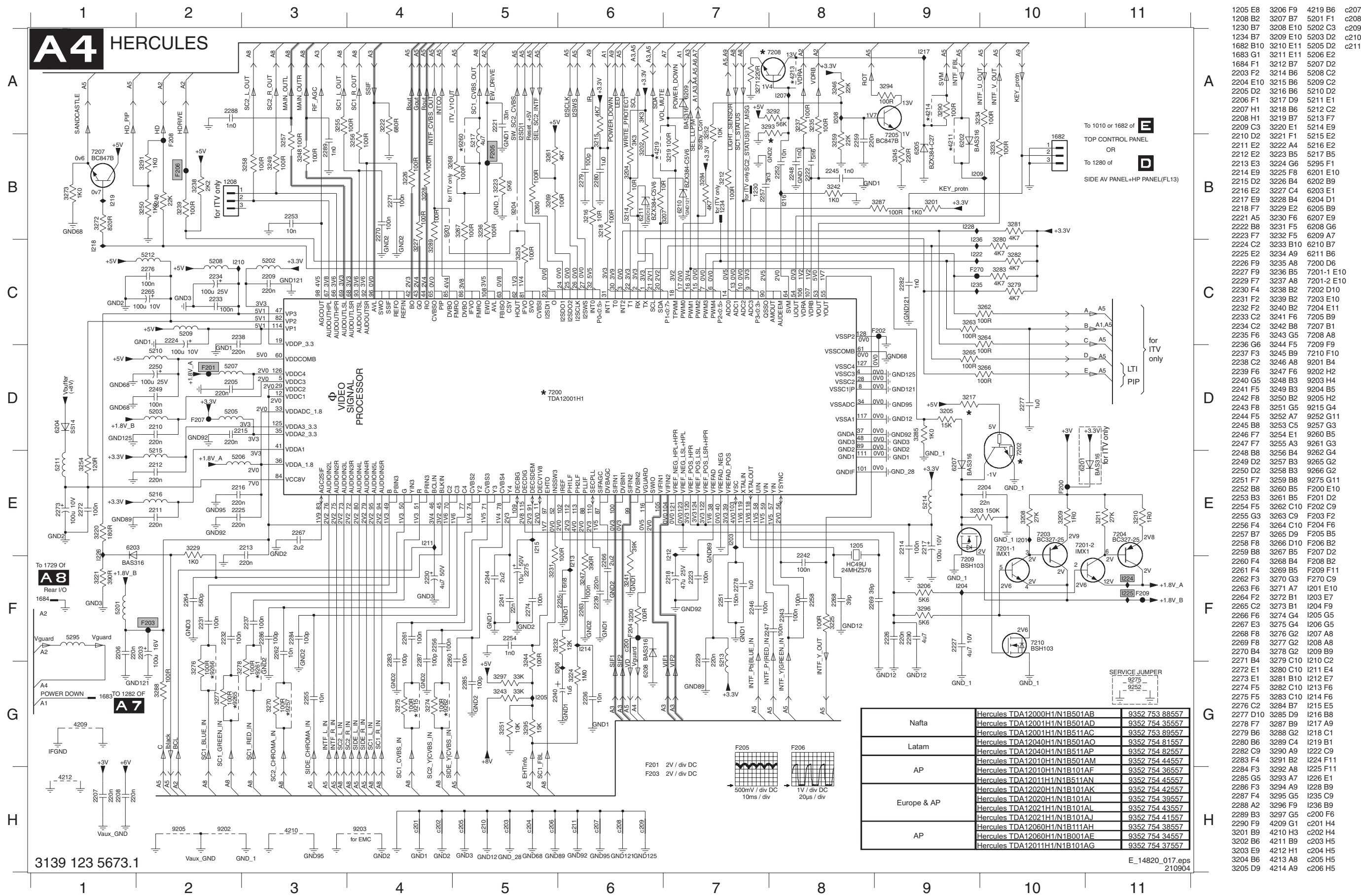
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1404 B5	6403 C1
1451 F9	6404 D4
1404 B8	6405 C3
1453 G2	6407 E2
1454 C8	6408 E3
1470 B8	6410 D5
1401 B3	6411 D4
2402 C4	6412 D4
2403 C4	6441 C3
2404 A4	6442 C3
2404 B4	6443 C4
2406 A5	6450 B9
2408 B2	6451 B8
2409 C2	6452 C8
2409 D2	6453 C2
2411 D4	6454 D9
2412 D4	6455 D9
2413 D4	6456 D5
2414 D4	6457 E7
2415 C5	6458 E8
2416 D5	6459 D8
2417 C5	6460 D8
2419 D5	6462 A10
2420 D1	6483 C9
2421 D1	6484 C9
2427 A5	6486 C1
2428 G4	6488 G5
2451 B8	6489 G5
2452 B8	6490 G5
2454 C9	7401 A3
2455 C9	7402 B3
2456 D9	7403 B4
2457 D9	7404 B4
2458 C9	7405 C4
2459 D7	7406 F3
2460 D7	7406 C2
2461 D7	7410 C2
2462 E7	7411 F3
2463 E8	7451 E9
2464 F8	7452 F8
2465 F8	7453 F8
2468 F8	7455 E6
2469 F8	7456 E7
2480 F8	7481 B9
2481 B8	7482 A9
2482 F3	7483 A8
2483 A8	7484 B8
2484 C9	9401 D5
2485 C8	9402 D6
2487 A4	9407 E6
2488 C3	9410 A7
2489 C3	9417 C6
2490 D9	9451 D10
2491 A9	F401 A1
2492 A9	F402 A2
3402 B3	F407 D3
3403 C5	F412 C1
3404 B3	F414 A2
3406 B3	F415 A5
3407 B3	F416 B6
3408 B4	F417 B6
3409 B4	F418 B4
3411 A4	F419 C4
3412 B5	F420 A5
3414 C1	F511 A1
3415 C2	F512 C1
3416 C4	F553 C10
3417 C5	F454 C3
3418 F2	F455 D9
3419 F2	F456 D9
3425 E4	F457 E8
3425 F5	F458 F9
3428 F5	F459 F9
3429 F5	F460 F9
3431 F4	F461 F6
3432 A5	F462 A9
3433 A6	F463 C9
3434 A6	F464 C9
3436 A4	F465 C6
3437 F9	F466 B2
3440 D3	401 B2
3441 C2	402 B3
3442 B8	403 B3
3443 B8	404 B3
3445 C1	405 B3
3446 C1	406 B3
3451 A6	407 B4
3452 A7	409 B5
3453 B7	410 C4
3454 B7	411 C4
3455 D7	413 D2
3457 D8	414 C3
3458 D8	415 F3
3460 F6	416 E3
3461 F7	417 G2
3462 E7	416 C3
3463 E7	417 C3
3464 E8	421 G4
3465 E7	422 F5
3466 F9	423 E4
3467 F9	424 A2
3468 F9	425 C2
3469 F7	426 G5
3470 F8	427 E2
3471 F8	428 A9
3472 F9	429 D9
3473 A8	430 C5
3474 E10	431 Q3
3475 E10	432 A2
3476 A9	433 A4
3477 A9	434 G2
3478 B9	443 A7
3479 B9	444 A7
3481 B9	445 A8
3482 B10	446 B7
3483 B10	447 B8
3484 B8	448 B9
3485 D8	451 A7
3486 D8	452 B8
3487 A8	453 C8
3488 A8	454 C8
3489 C1	456 D9
3490 A8	457 C7
3491 A8	458 D7
3492 B8	460 E7
3493 B8	461 E8
3494 B8	462 D9
3495 B8	463 F5
3496 G2	464 F8
3497 A1	465 B5
4437 E9	466 C8
4438 E9	467 C8
5401 B6	468 F7
5402 C3	469 A8
5403 E4	470 E7
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5405 E5	472 F9
5406 E5	473 A5
5410 A5	474 D5
5411 A5	475 D5

A3 TUNER IF

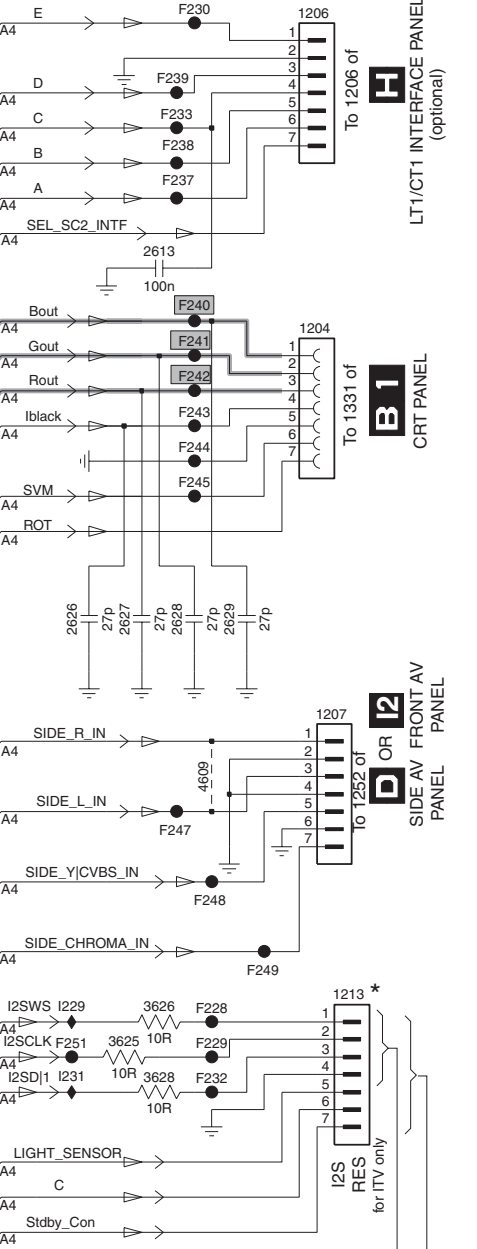
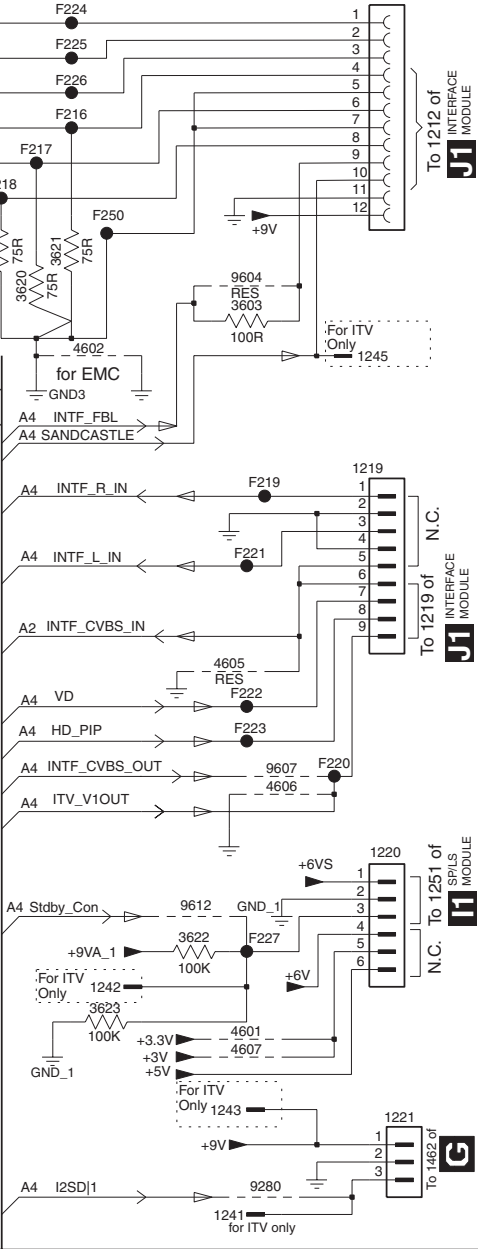
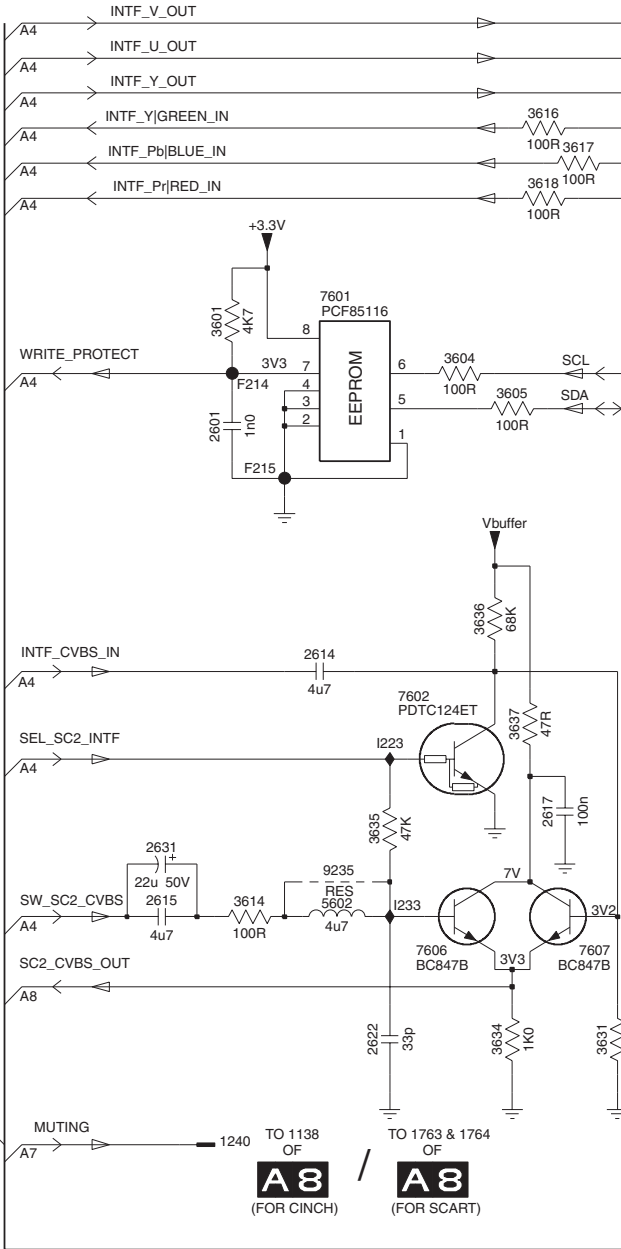
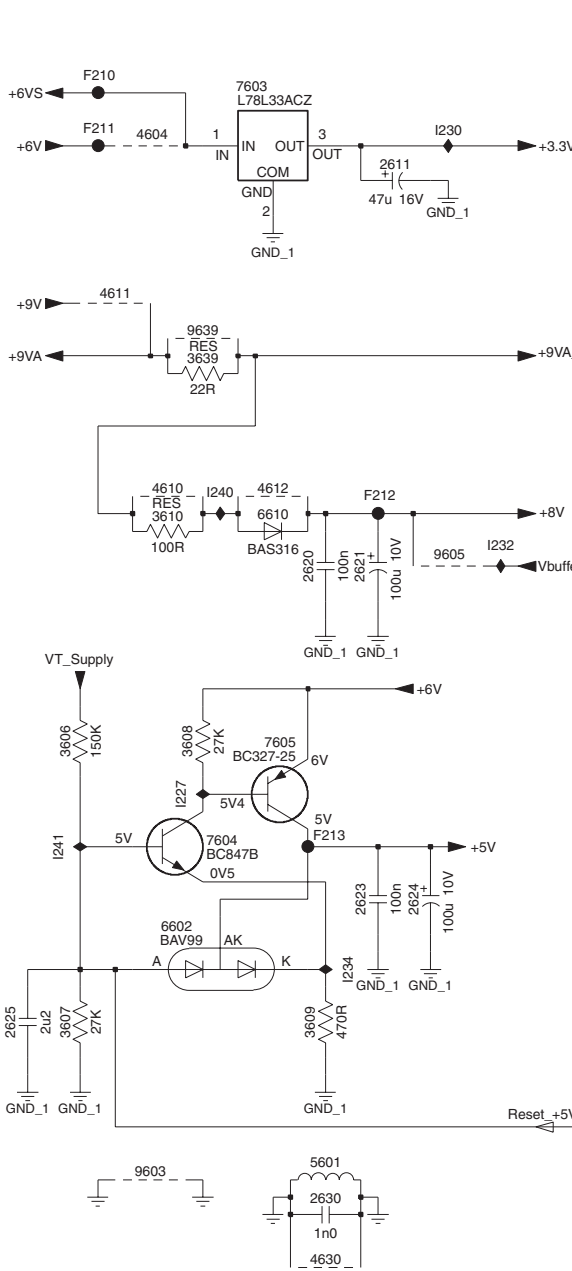


Mono Carrier: Hercules



Mono Carrier: Features & Connectivities

A5 FEATURES & CONNECTIVITIES



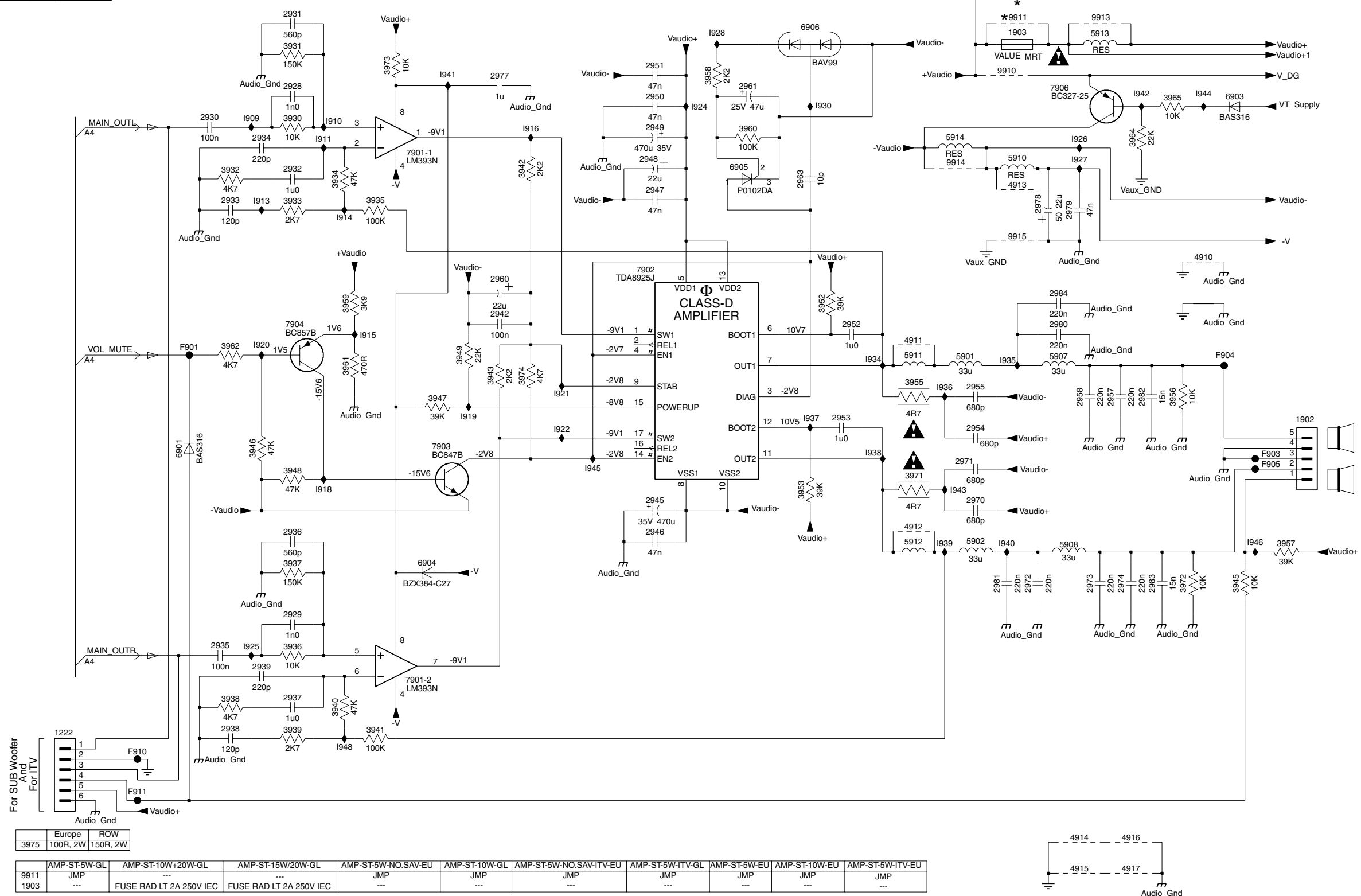
	DVD	iDTV	USB	PCMCIA
A	-	Power On	Power On	Power On
B	-	Bus Request	Bus Request	Bus Request
C	-	-	-	-
D	-	-	-	-
E	-	-	-	-

	MTV	ITV
1	I2SWS	ITV DATA OUT/SDA
2	I2SCLK	ITV DATAIN
3	I2SDI1	ITV CLOCK
4	GND	GND
5	Light sensor	ITV SCL
6	C	ITV POR 1
7	Stby-con	Stby-con

- 1204 B9
- 1206 A9
- 1207 D9
- 1212 A7
- 1213 E9
- 1219 C8
- 1220 E8
- 1221 F8
- 1240 F4
- 1241 F7
- 1242 E6
- 1243 F7
- 1245 C7
- 2601 C4
- 2611 B2
- 2613 B9
- 2614 D5
- 2615 E4
- 2617 D6
- 2620 C2
- 2621 C2
- 2622 E5
- 2623 E2
- 2624 E2
- 2625 E1
- 2626 D8
- 2627 D9
- 2628 D9
- 2629 D9
- 2630 F2
- 2631 E4
- 3601 B4
- 3603 B7
- 3604 C5
- 3605 C5
- 3606 D1
- 3607 E1
- 3608 D2
- 3609 E2
- 3610 C1
- 3614 E4
- 3616 B6
- 3617 B6
- 3618 B6
- 3619 B6
- 3620 B6
- 3621 B6
- 3622 E7
- 3623 E7
- 3625 E9
- 3626 E9
- 3631 E6
- 3634 E5
- 3635 D5
- 3636 D5
- 3637 D5
- 3639 C2
- 4601 E7
- 4602 B6
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- 4605 D7
- 4606 D7
- 4607 E7
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- 4610 C1
- 4611 B1
- 4612 C2
- 4630 F2
- 5601 F2
- 5602 E5
- 6602 E1
- 6610 C2
- 7601 B5
- 7602 D5
- 7603 A2
- 7604 D2
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- 7606 E5
- 7607 E6
- 9235 E5
- 9280 F7
- 9603 F1
- 9604 B7
- 9605 C3
- 9607 D7
- 9612 E7
- 9639 B2
- F210 A1
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- F212 C2
- F213 D2
- F214 C4
- F215 C4
- F216 B6
- F217 B6
- F218 B6
- F219 C7
- F220 D7
- F221 C7
- F222 D7
- F223 D7
- F224 A6
- F225 A6
- F226 A6
- F227 E7
- F228 E9
- F229 E9
- F230 A9
- F232 E9
- F233 B9
- F237 B9
- F238 B9
- F239 A9
- F240 A9
- F241 B9
- F242 C9
- F243 C9
- F244 C9
- F245 C9
- F247 D9
- F248 E9
- F249 E9
- F250 B7
- F251 E8
- I223 D5
- I227 D1
- I229 E8
- I230 B3
- I231 E8
- I232 C3
- I233 E5
- I234 E2
- I240 C2
- I241 D1

Mono Carrier: Class D - Audio Amplifier

A6 CLASS D - AUDIO AMP (RESERVED)



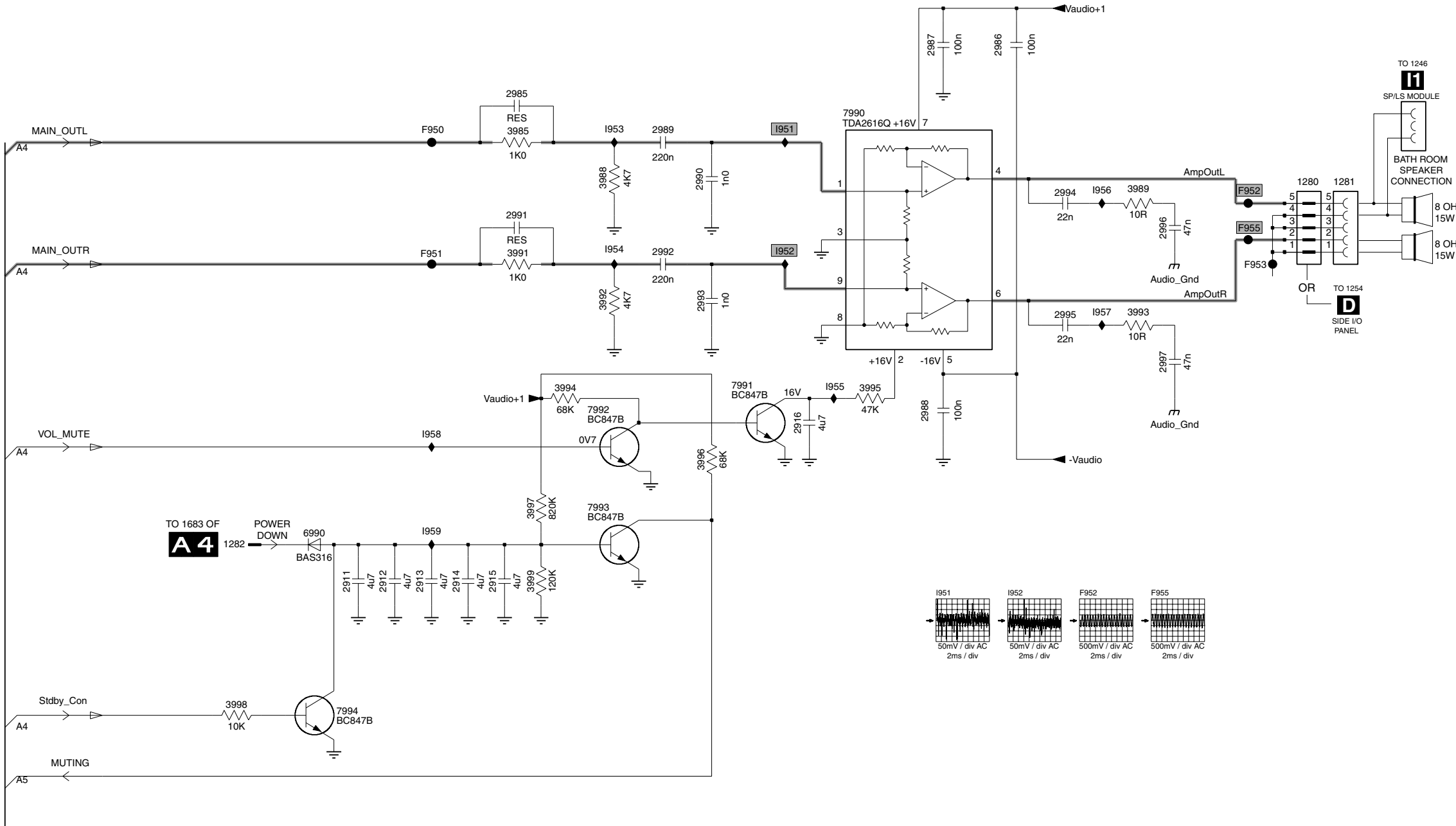
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- 1222 F1
- 1902 C9
- 1903 A7
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- 2932 B2
- 2933 B2
- 2934 B2
- 2935 E2
- 2936 D2
- 2937 E2
- 2938 F2
- 2939 E2
- 2942 C4
- 2945 D5
- 2946 D5
- 2947 B5
- 2948 B5
- 2949 A5
- 2950 A5
- 2951 A5
- 2952 C6
- 2953 C6
- 2954 D7
- 2955 C7
- 2957 C8
- 2958 C8
- 2960 B4
- 2961 A5
- 2963 B6
- 2970 D7
- 2971 D7
- 2972 E7
- 2973 E8
- 2974 E8
- 2977 A4
- 2978 B7
- 2979 B8
- 2980 C8
- 2981 E7
- 2982 C8
- 2983 E8
- 2984 C8
- 2930 A2
- 2931 A2
- 2932 B2
- 2933 B2
- 2934 B3
- 2935 B3
- 2936 E2
- 2937 D2
- 2938 E2
- 2939 F2
- 2940 E3
- 2941 F3
- 2942 B4
- 2943 C4
- 2945 E9
- 2946 D2
- 2949 C3
- 2947 C3
- 2948 D2
- 2949 C3
- 2952 C6
- 2953 D6
- 2955 C7
- 2956 C8
- 2957 D9
- 2958 A5
- 2959 C3
- 2960 A5
- 2961 C3
- 2962 C2
- 2964 A8
- 2965 A8
- 2971 D7
- 2972 E8
- 2973 A3
- 2974 C4
- 2975 A7
- 2976 B9
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- 4912 D7
- 4913 B7
- 4914 F8
- 4915 F8
- 4916 F8
- 4917 F8
- 4901 C7
- 4902 D7
- 4907 C8
- 4908 D8
- 4910 B7
- 4911 C7
- 4912 D7
- 4913 A8
- 4914 B7
- 4915 B7
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- 4904 C9
- 4905 D9
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- 4911 F1
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- 4910 A3
- 4911 A3
- 4913 B2
- 4914 B3
- 4915 C3
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- 4919 C4
- 4920 C2
- 4921 C4
- 4922 C4
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- 4925 E2
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- 4928 A5
- 4930 A6
- 4934 C6
- 4935 C7
- 4936 C7
- 4937 C6
- 4938 D6
- 4939 D7
- 4940 D7
- 4941 A3
- 4942 A8
- 4943 D7
- 4944 A9
- 4945 D4
- 4946 D9
- 4948 F3

Mono Carrier: Audio Amplifier

A7 AUDIO_AMPLIFIER



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100904

1280 B9
1281 B9
1282 D3
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2914 D4
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3993 C8
3994 C4
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3998 E3
3999 D4
6990 D3
7990 B6
7991 C6
7992 C5
7993 D5
7994 E3
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F951 B4
F952 B8
F953 C9
F955 B8
I951 B6
I952 B6
I953 B5
I954 B5
I955 C6
I956 B8
I957 C8
I958 D4
I959 D4

Mono Carrier: Rear I/O Cinch

A8 REAR I/O CINCH

A

B

C

D

E

F

A

B

C

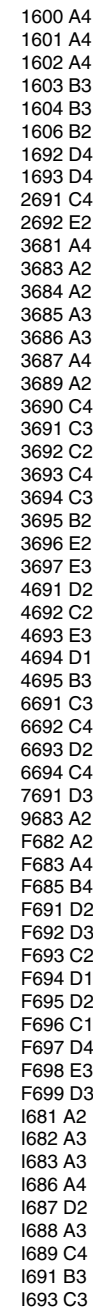
D

E

F

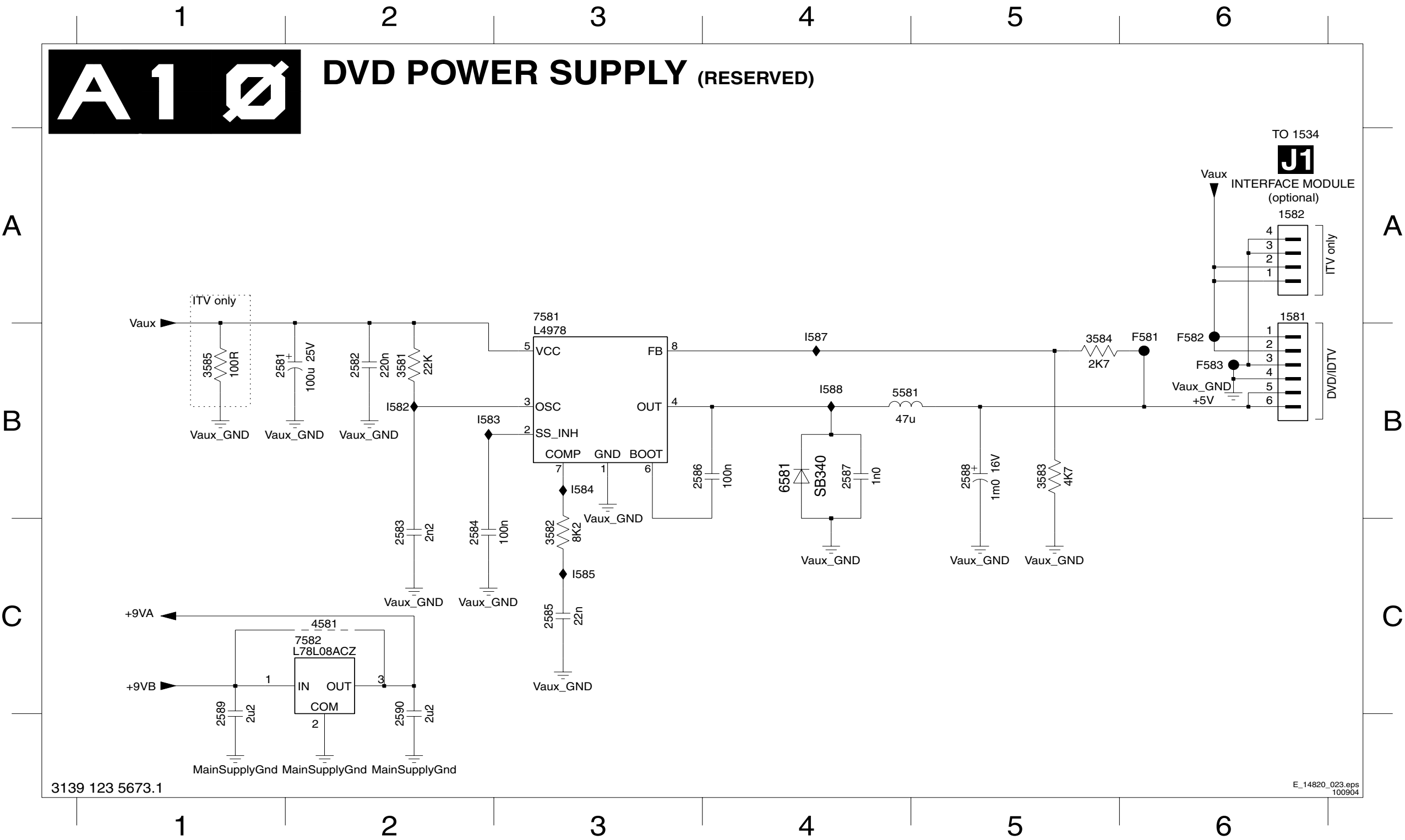
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1113 C8
1137 B9
1138 A3
1153 F9
1223-1 B2
1223-2 C2
1223-3 E2
1227 B6
1228 E9
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1237 F9
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1266 F5
1267 D5
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2105 B5
2106 B5
2107 B3
2108 B3
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2123 E5
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2125 E5
2126 E3
2127 F3
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2132 D7
2133 E7
2134 D7
2136 D8
2137 E8
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2158 F7
2159 F8
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3105 B4
3106 B4
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3112 C4
3113 C4
3114 C4
3115 D4
3116 D4
3121 E4
3122 D4
3123 E3
3124 E5
3125 E3
3126 F5
3129 C9
3130 C9
3131 D8
3132 D7
3133 D8
3134 E7
3135 C7
3136 C7
3138 C7
3156 F8
3157 E8
3161 E7
3162 E9
- 3164 F7
3166 E7
3167 C5
3168 D5
3169 C5
4101 C2
4102 C3
4103 C2
4104 D8
4105 E3
4106 C3
4107 C3
4108 D3
4109 C3
4110 E3
4111 E3
4112 B5
4113 D6
4115 E6
4116 C9
4117 F9
4130 C9
4136 C7
4144 E6
6106 E3
6132 C8
7103 E8
7104-1 A4
7104-2 A4
9101 D6
9112 C4
9113 E4
9114 C4
9116 D4
9138 C7
F101 A3
F102 B3
F103 B3
F104 C2
F105 C2
F106 D2
F107 D2
F108 E2
F109 E2
F110 D8
F111 D8
F112 C8
F113 C8
F115 B7
F116 B5
F117 B5
F119 E9
F120 F9
F121 E9
F122 D2
F123 E2
F138 F6
I104 C5
I105 C5
I106 D5
I107 B4
I108 B4
I109 E5
I110 D5
I111 E5
I112 E5
I113 D7
I114 D7
I115 C7
I116 D6
I117 E7
I118 E8
I119 E8
I120 D6

A9 FRONT CONTROL

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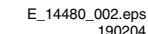
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060804

Mono Carrier: DVD Power Supply



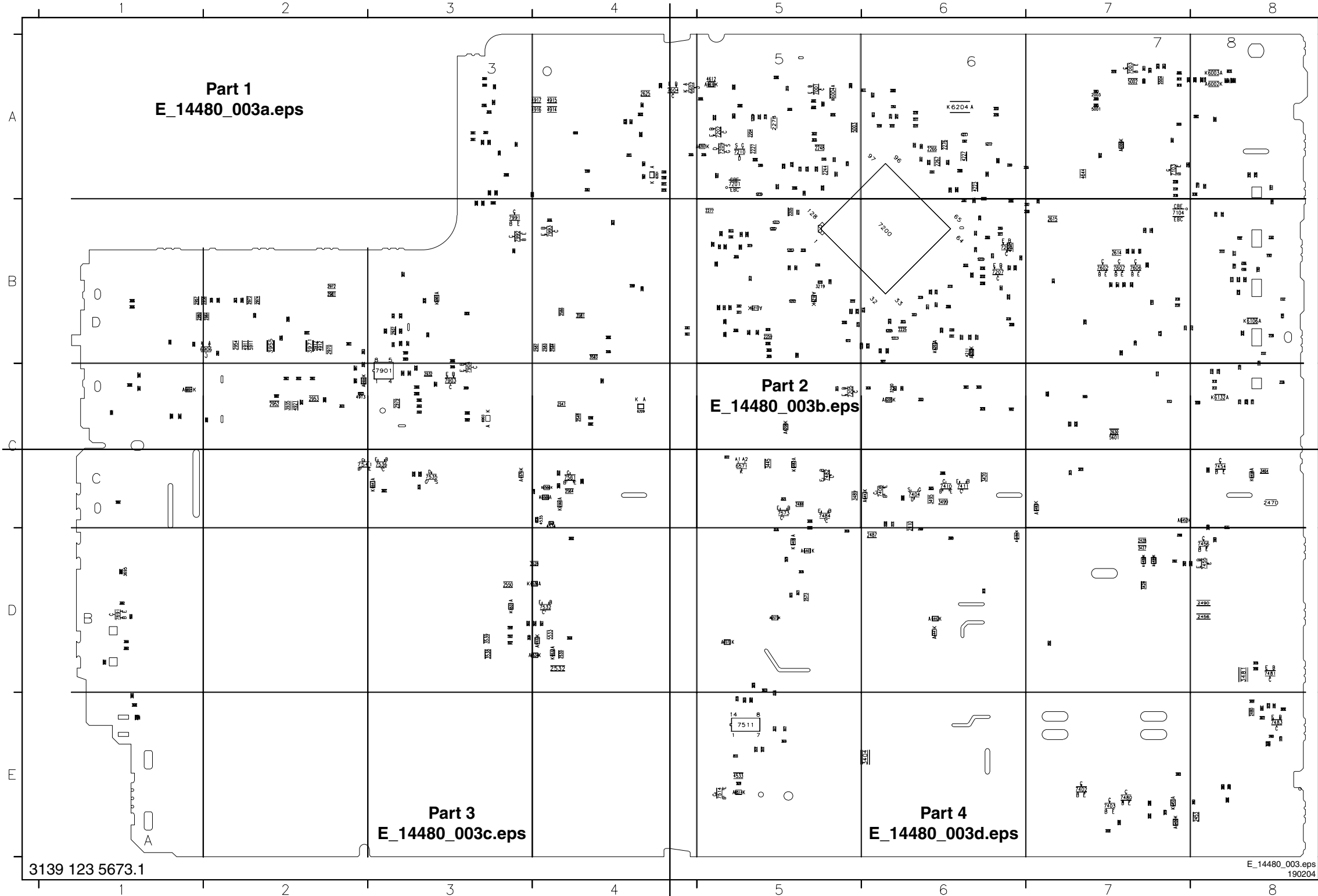
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- 2582 B2
- 2583 C2
- 2584 C2
- 2585 C3
- 2586 B3
- 2587 B4
- 2588 B5
- 2589 C1
- 2590 C2
- 3581 B2
- 3582 C3
- 3583 B5
- 3584 B5
- 3585 B1
- 4581 C2
- 5581 B4
- 6581 B4
- 7581 A3
- 7582 C2
- F581 B6
- F582 B6
- F583 B6
- I582 B2
- I583 B2
- I584 B3
- I585 C3
- I587 B4
- I588 B4

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1001	E6	1213	C5	1401	C7	1510	B1	1902	D2	2250	D6	2427	B6	2503	A4	2542	B4	2945	D2	3133	D8	3270	D7	3418	C5	3461	C7	3505	A2	3532	B3	3945	D3	5500	B2	5602	D7	6453	B7	6573	B5	7531	B3	9122	D6
1002	E5	1219	C7	1402	A6	1532	B3	1903	D3	2251	E5	2451	A8	2543	B4	2543	B3	2948	D2	3138	D8	3274	D7	3425	C5	3466	C7	3506	B1	3534	B4	3961	C3	5501	B2	5603	C7	6454	B8	6575	A4	7571	B5	9123	D5
1003	E5	1220	E4	1404	A5	1535	C5	2006	E7	2265	E6	2454	A8	2505	A4	2545	B3	2949	D2	3157	E8	3275	E7	3430	B6	3467	C7	3507	B3	3542	B3	3962	D3	5502	A3	5901	D2	6455	B8	6581	D4	7581	D4	9124	D4
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1010	E7	1223	D8	1453	B5	1545	C4	2105	D7	2401	A7	2458	C7	2508	C2	2552	C5	2978	C3	3215	D5	3278	D7	3433	B6	3471	C7	3510	B2	3574	B5	5208	D6	5512	B4	5908	D2	6480	B8	6693	B1	7605	E5	9128	D8
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1017	C8	1234	D5	1502	B2	1601	C1	2134	C8	2411	B6	2465	C8	2516	B4	2565	C4	3105	D8	3234	C6	3406	A7	3442	A7	3484	B8	3515	A5	3585	D4	5402	B6	5532	B3	6401	A6	6511	A5	7401	A6	9002	E7	9202	E6
1018	E7	1236	D7	1503	C3	1602	D1	2203	D5	2412	A6	2467	C7	2534	B3	2570	C4	3112	D8	3239	C7	3407	A7	3443	A7	3485	B8	3516	A4	3603	C6	5403	B												



Layout Mono Carrier (Overview Bottom Side)

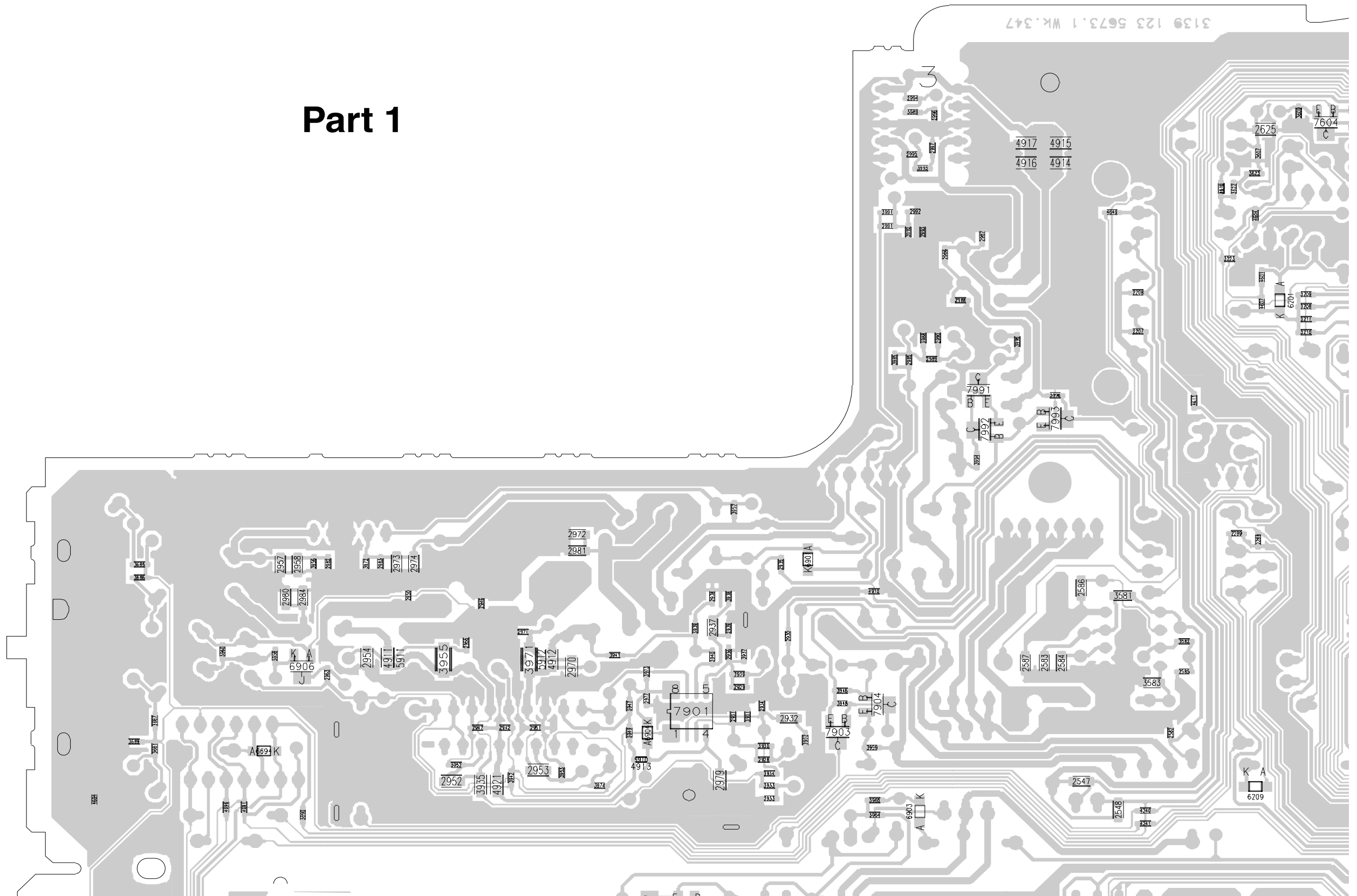
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2002 A8	2133 C8	2214 A5	2239 A5	2259 B5	2279 B5	2425 C6	2491 E8	2550 D3	2617 B7	2934 C3	2963 B2	2989 B3	3008 A7	3132 C8	3208 A4	3228 B6	3253 A6	3273 B6	3404 E6	3474 C7	3498 C6	3958 B1	4635 C7	6541 C3
2003 A7	2136 C8	2215 B6	2241 A5	2260 A6	2280 B5	2428 D7	2512 E5	2553 D4	2620 A5	2935 B3	2970 B2	2990 A3	3009 A5	3134 C8	3209 A4	3229 B6	3254 A6	3279 B5	3405 E7	3475 C7	3499 C6	3959 C3	4637 B6	6564 C4
2004 A7	2137 B8	2216 B6	2242 B6	2261 A6	2282 B5	2453 E8	2513 E5	2564 C4	2622 B7	2936 B3	2971 B2	2991 A3	3010 A7	3135 C8	3210 A4	3232 A5	3255 A6	3280 B5	3409 E8	3476 E7	3512 E5	3960 B1	4642 A7	6565 C4
2007 A7	2157 A8	2221 A5	2243 B6	2262 B6	2283 A6	2456 D8	2515 D5	2566 C4	2623 A5	2937 B3	2972 B2	2992 A3	3014 A7	3136 C8	3211 A4	3233 C6	3256 A6	3281 B5	3416 D6	3477 E8	3517 E5	3964 C3	4644 A7	6566 C4
2009 A7	2158 A8	2222 A5	2244 A5	2263 A6	2284 A6	2461 D7	2516 E5	2571 D5	2625 A4	2938 B3	2973 B2	2993 A3	3016 A7	3156 A8	3212 B5	3235 A5	3257 B7	3282 B5	3420 C6	3478 D8	3518 E5	3965 C3	4645 B6	6571 C5
2013 A7	2159 A7	2223 B6	2245 A5	2264 B6	2285 A6	2462 D7	2517 E5	2572 C5	2626 C6	2939 B3	2974 B2	2994 A3	3018 A7	3161 B8	3214 B5	3236 A5	3259 B5	3283 B5	3427 D7	3480 E7	3522 E5	3971 B2	4646 B5	6572 D5
2014 A7	2163 A7	2225 B6	2246 B6	2266 A6	2286 B6	2464 C8	2518 E5	2573 D5	2627 B6	2942 C2	2977 C2	2995 A3	3019 A7	3162 A8	3216 B6	3237 A5	3261 B4	3284 B5	3428 D7	3481 D8	3524 E5	3972 B2	4648 B7	6576 C3
2016 A7	2204 A5	2226 A5	2247 B6	2267 A6	2287 B6	2468 C8	2519 E5	2582 C4	2628 B6	2946 B2	2979 C3	2996 A3	3104 B7	3164 B8	3217 A5	3238 B6	3262 B5	3285 A4	3436 D5	3486 D8	3527 D4	3973 B2	4649 A4	6602 A4
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2122 B8	2209 B5	2233 B6	2254 A6	2272 A6	2408 C6	2483 E8	2538 C4	2587 B4	2929 B3	2953 C2	2984 B2	3003 A7	3121 B8	3203 A5	3222 A6	3245 C5	3267 A6	3292 B6	3462 D8	3491 E8	3536 C3	3991 A3	4695 E1	6904 C2
2124 B7	2210 B5	2235 A5	2255 A7	2274 A6	2409 D6	2487 D6	2544 D4	2601 B5	2930 B3	2954 B2	2985 B3	3004 A8	3124 B7	3204 B5	3223 A4	3247 A6	3268 B7	3293 B6	3463 D8	3492 E8	3537 D3	3992 A3	4696 C1	6906 B2
2126 B8	2211 B6	2236 A5	2256 A6	2276 A6	2410 C6	2488 C5	2547 C4	2613 B5	2931 C3	2955 B2	2986 A3	3005 A7	3126 B7	3205 A5	3225 B6	3248 B7	3269 B5	3294 C6	3464 C8	3493 E8	3538 D3	3993 A3	4910 B3	7001 A5
2127 B8	2212 B5	2237 B6	2257 A6	2277 B5	2414 C6	2489 D6	2548 C4	2614 B7	2932 C3	2957 B1	2987 A3	3006 A5	3129 C8	3206 A5	3226 B6	3250 B7	3271 B6	3295 A5	3469 C8	3494 E8	3539 D3	3994 B3	4911 B2	7003 A7



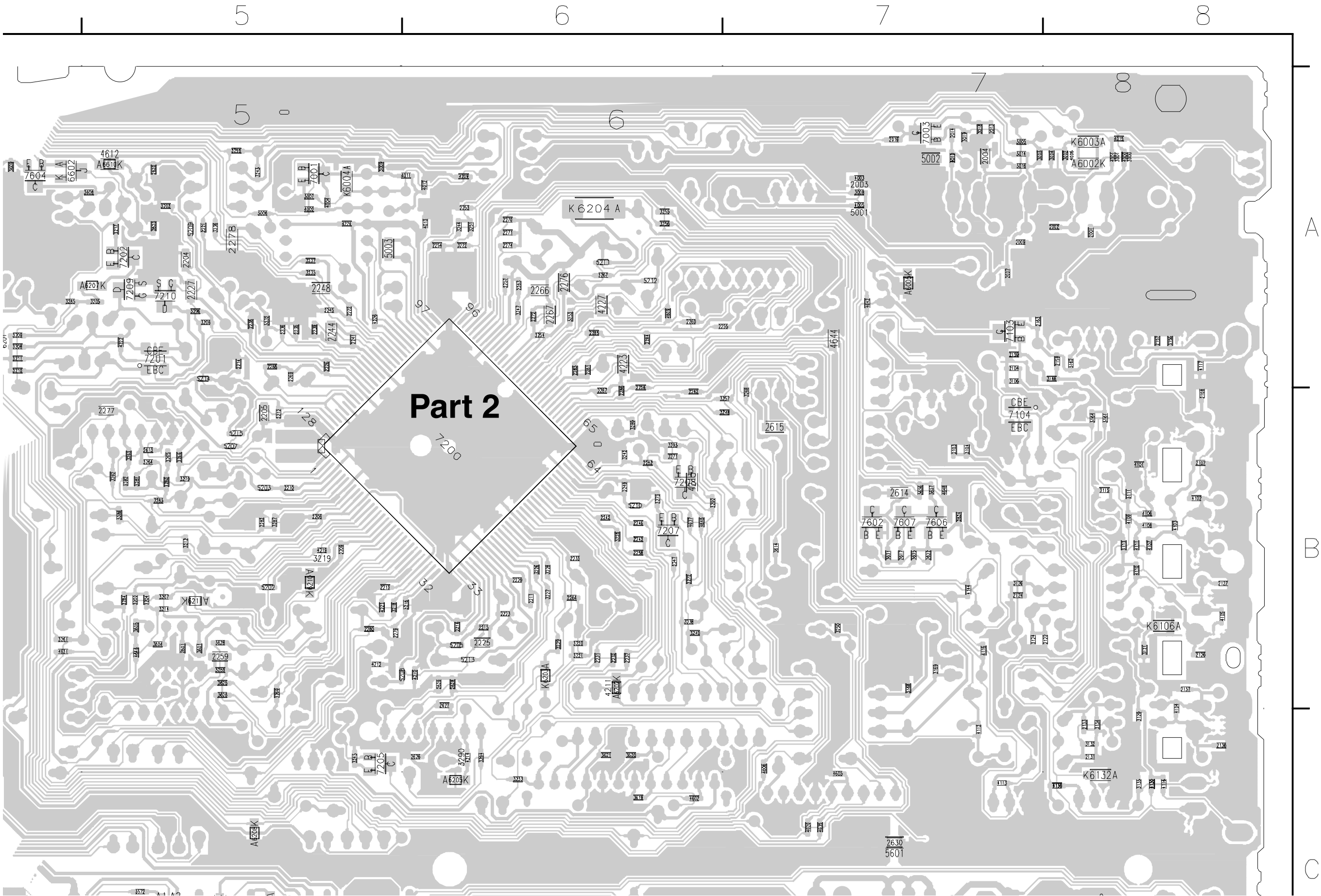
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3573 D5	4001 A8	4915 A4	7201 A5
3576 D5	4002 A5	4916 A4	7202 A5
3578 D5	4003 A7	4917 A4	7205 C5
3579 D5	4004 A5	4921 C2	7207 B6
3581 B4	4005 A7	5001 A7	7208 B6
3582 B4	4006 A8	5002 A7	7209 A5
3583 B4	4010 A7	5003 A5	7210 A5
3601 B5	4011 A6	5202 B5	7402 E7
3604 B5	4012 A6	5203 B5	7403 E7
3605 B5	4013 A6	5205 B6	7404 C6
3607 A4	4015 A8	5206 B5	7408 C6
3608 A5	4101 B8	5207 B5	7410 C6
3609 A4	4102 B8	5209 A5	7411 C6
3610 A4	4103 B8	5210 B6	7454 C8
3614 B7	4104 B8	5211 A6	7455 D8
3619 C6	4105 B8	5212 A6	7456 D8
3620 C6	4106 B8	5213 B6	7480 E7
3621 C6	4107 B8	5214 A5	7481 D8
3622 A4	4108 B8	5215 B5	7482 C5
3623 A4	4109 B8	5513 D5	7483 E8
3625 B5	4110 B8	5533 C4	7484 C5
3626 B5	4111 B8	5534 C4	7511 E5
3628 B5	4112 C7	5535 C4	7514 E5
3631 B7	4113 C7	5601 C7	7532 D4
3634 B7	4115 B7	5910 C2	7535 C3
3635 B7	4116 C8	5911 B2	7536 C3
3636 B7	4117 A8	5912 B2	7541 C2
3637 B7	4130 C8	6002 A8	7561 C4
3681 C1	4136 C8	6003 A8	7573 C5
3684 C1	4144 B7	6004 A5	7602 B7
3685 B1	4209 A6	6005 A7	7604 A4
3686 B1	4210 B6	6106 B8	7606 B7
3687 C1	4211 B6	6132 C8	7607 B7
3689 C1	4212 B5	6201 A4	7691 D1
3690 C2	4213 B6	6202 B6	7901 C3
3691 E1	4214 C6	6203 B6	7903 C3
3692 E1	4219 B5	6204 A6	7904 C3
3693 D1	4221 B5	6205 C6	7991 B3
3694 E1	4222 A5	6207 A5	7992 B3
3695 D1	4223 A6	6208 C5	7993 B4
3696 D1	4224 A5	6209 C4	
3697 D1	4226 A5	6210 B5	
3930 C3	4227 A6	6211 B5	
3931 C3	4240 C4	6407 D5	
3932 C3	4241 C4	6408 D5	
3933 C3	4470 E8	6441 D6	
3934 C3	4492 E8	6442 D6	
3935 C2	4533 E5	6443 C6	
3936 B3	4534 C4	6450 E7	
3937 B3	4535 C4	6451 E7	
3938 B3	4536 C3	6457 C7	
3939 B3	4537 C4	6458 C8	
3940 B3	4601 A4	6482 C5	
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3942 C2	4604 A4	6484 D6	
3946 B3	4605 C7	6488 D7	
3947 C2	4606 C7	6489 D7	
3948 C3	4607 A4	6512 D5	
3949 C2	4609 A6	6514 E5	
3952 C2	4610 A4	6531 D3	
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3955 B2	4612 A5	6533 D4	
3956 B2	4620 C7	6534 D4	

4

C



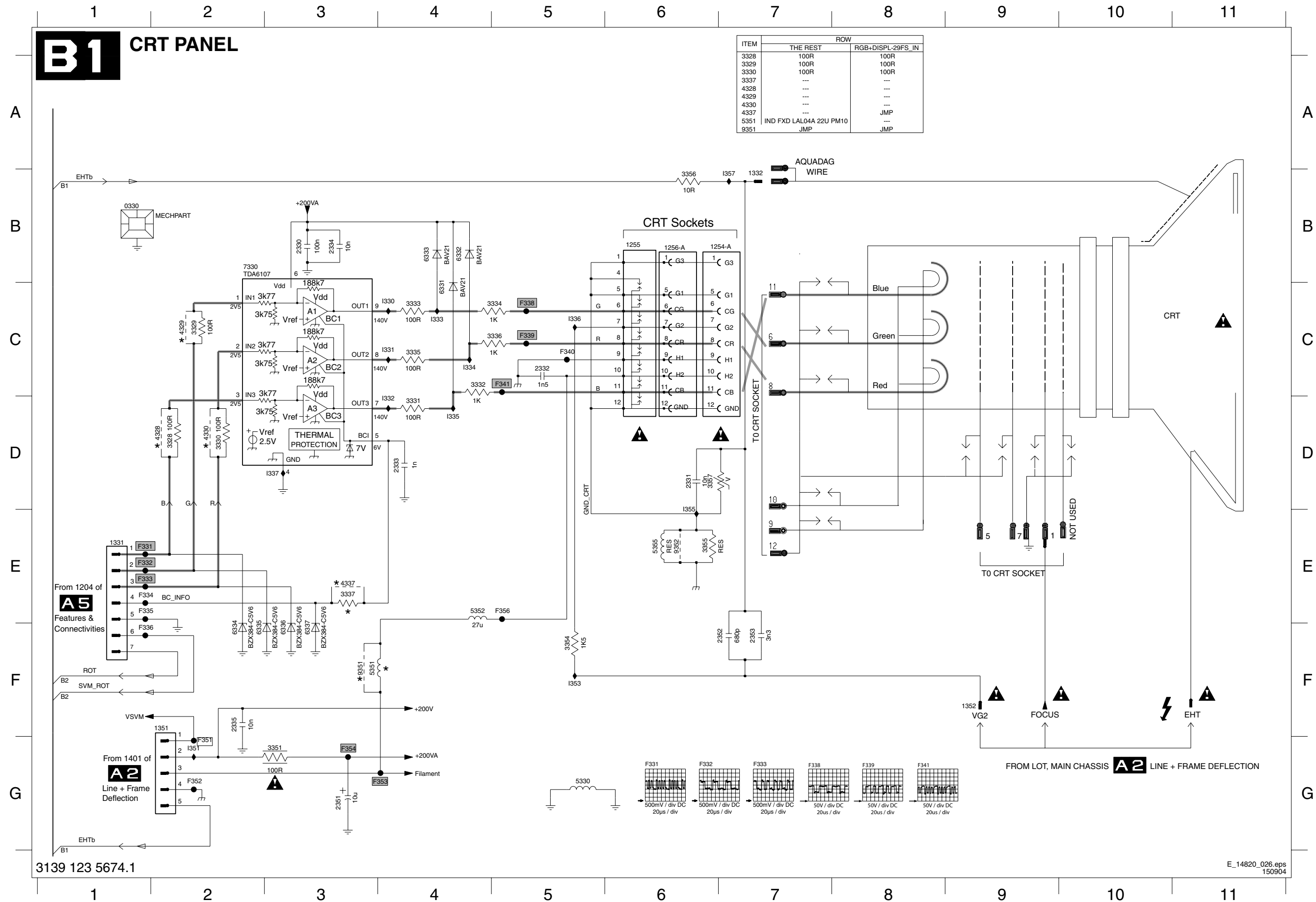
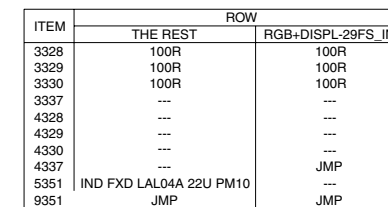
Layout Mono Carrier (Part 2 Bottom Side)



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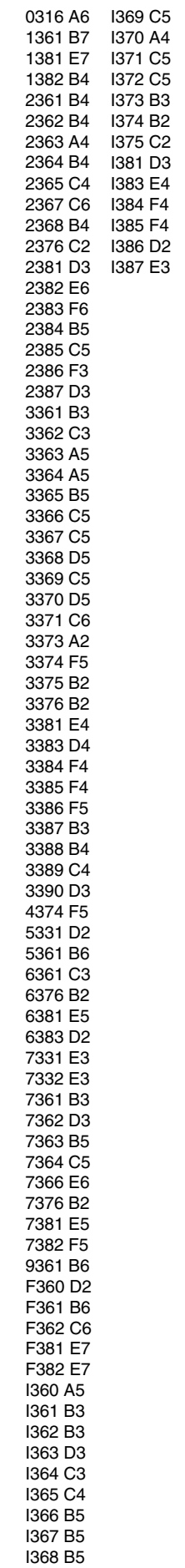
Part 4

B1 CRT PANEL



0330 B1
1254-A B7
1255 B6
1256-A B6
1331 E1
1332 B7
1351 F2
1352 F9
2330 B3
2331 D6
2332 C5
2333 D4
2334 B3
2335 F2
2351 G3
2352 F6
2353 F7
3328 D2
3329 C2
3330 D2
3331 D4
3332 C4
3333 C4
3334 C5
3335 C4
3336 C5
3337 E3
3351 G3
3354 F5
3355 E6
3356 B6
3357 D6
4328 D2
4329 C2
4330 D2
4337 E3
5330 G5
5351 F3
5352 E4
5355 E6
6331 C4
6332 B4
6333 B4
6334 F2
6335 F2
6336 F3
6337 F3
7330 B2
9351 F3
9352 E6
F331 E1
F332 E1
F333 E1
F334 E1
F335 E1
F336 F1
F338 C5
F339 C5
F340 C5
F341 C5
F351 G2
F352 G2
F353 G4
F354 G3
F356 E5
I330 C4
I331 C4
I332 D4
I333 C4
I334 C4
I335 D4
I336 C5
I337 D3
I351 G2
I353 F5
I355 D6
I357 B7

B2 ECO SCAVEM

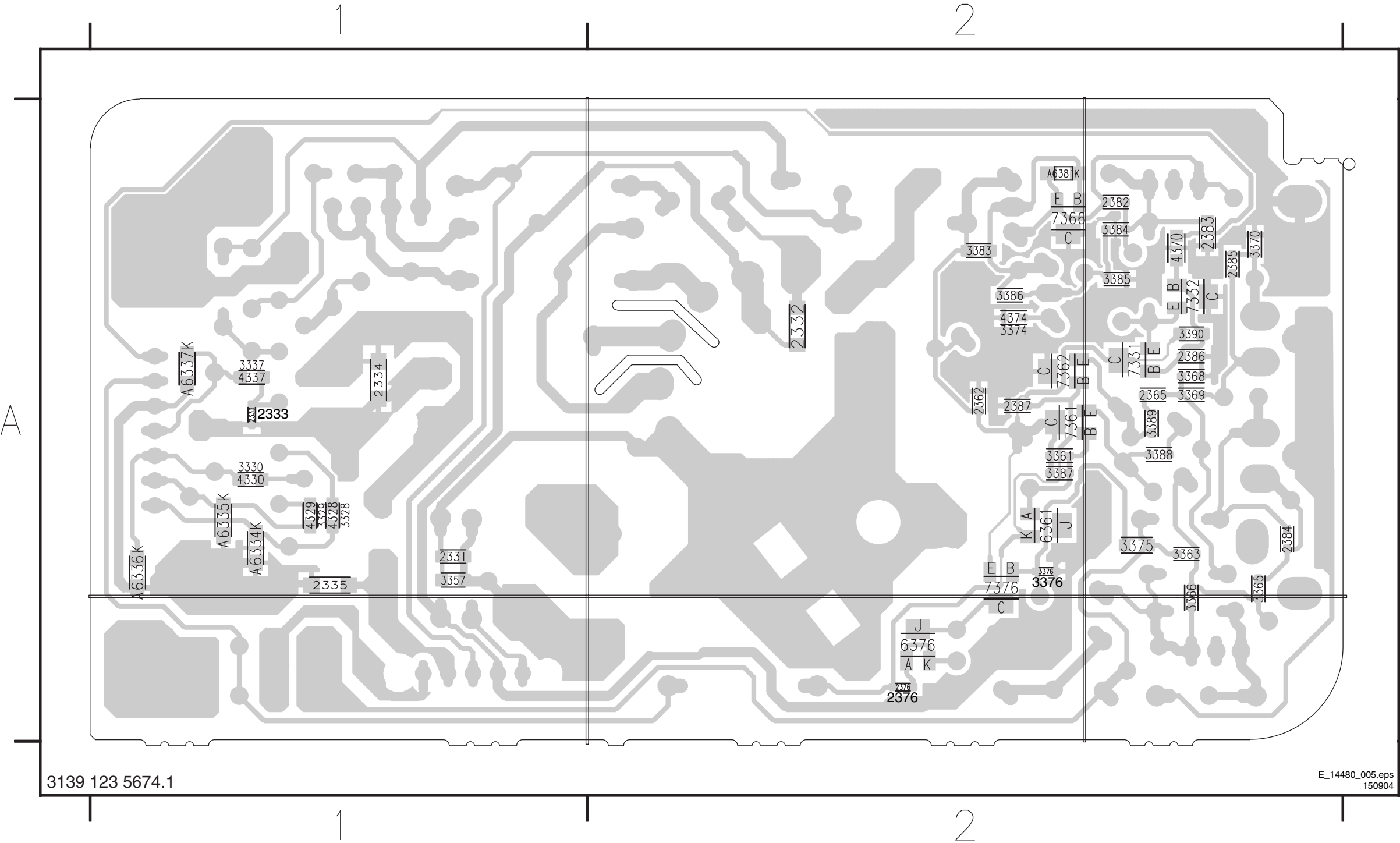


2



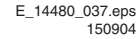
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0330	A1	5361	A2
1254	A2	6331	A1
1255	A2	6332	A1
1256	A2	6333	A1
1331	A1	6383	A2
1332	A1	7330	A1
1351	A1	7363	A2
1352	A1	7364	A2
1361	A2	7381	A2
1381	A2	7382	A2
2330	A1	9351	A1
2351	A1	9352	A1
2352	A1	9361	A2
2353	A2	9373	A1
2361	A2	9390	A2
2363	A2		
2364	A2		
2367	A2		
2368	A2		
2381	A2		
3331	A1		
3332	A2		
3333	A1		
3334	A1		
3335	A1		
3336	A1		
3351	A1		
3354	A2		
3355	A1		
3356	A1		
3362	A2		
3364	A2		
3367	A2		
3371	A2		
3373	A1		
3381	A2		
5330	A1		
5331	A2		
5351	A1		

Layout CRT Panel (Bottom Side)

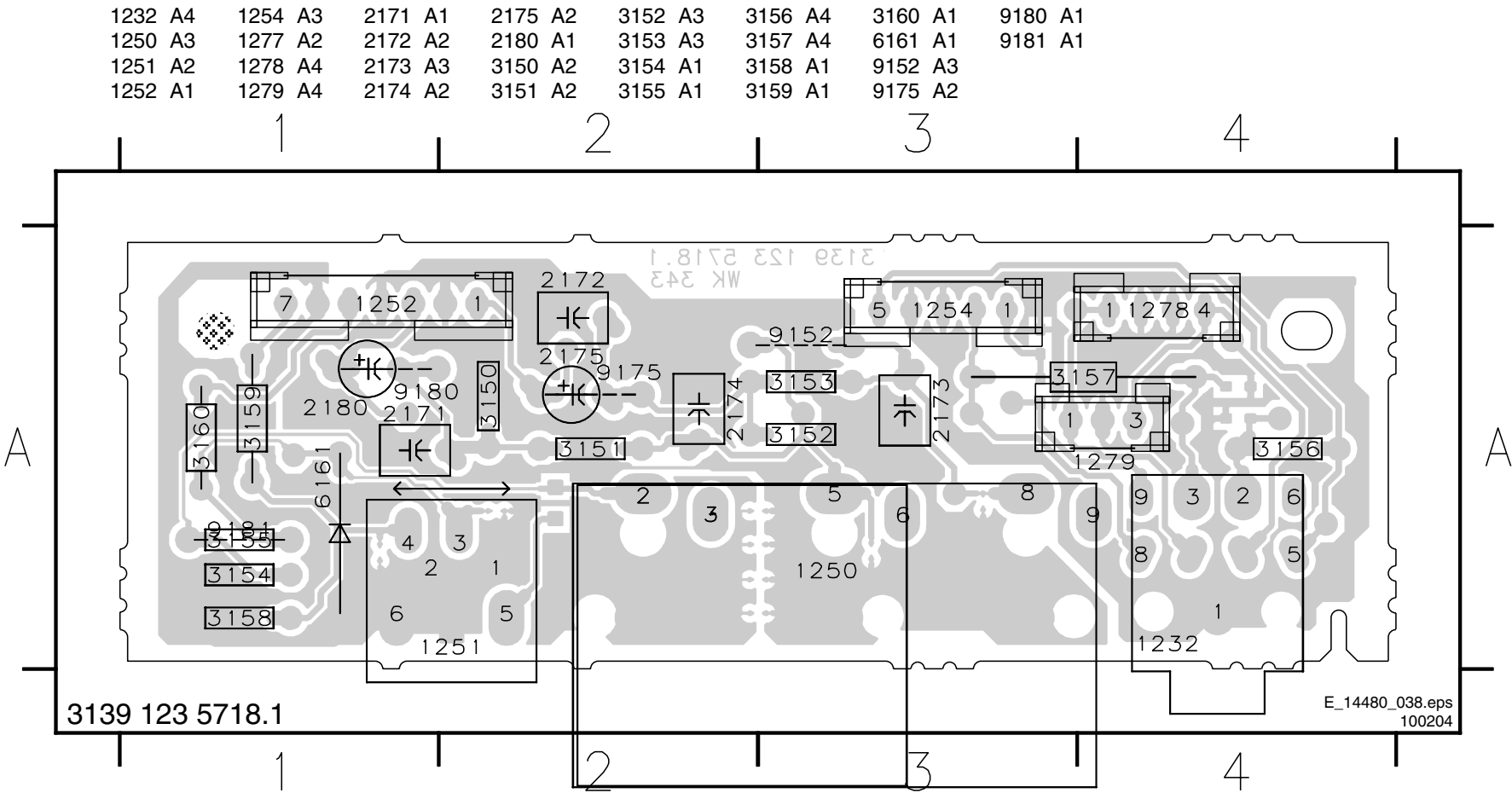


2331 A1	4370 A2
2332 A2	4374 A2
2333 A1	6334 A1
2334 A1	6335 A1
2335 A1	6336 A1
2362 A2	6337 A1
2365 A2	6361 A2
2376 A2	6376 A2
2382 A2	6381 A2
2383 A2	7331 A2
2384 A2	7332 A2
2385 A2	7361 A2
2386 A2	7362 A2
2387 A2	7366 A2
3328 A1	7376 A2
3329 A1	
3330 A1	
3337 A1	
3357 A1	
3361 A2	
3363 A2	
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3370 A2	
3374 A2	
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4337 A1	

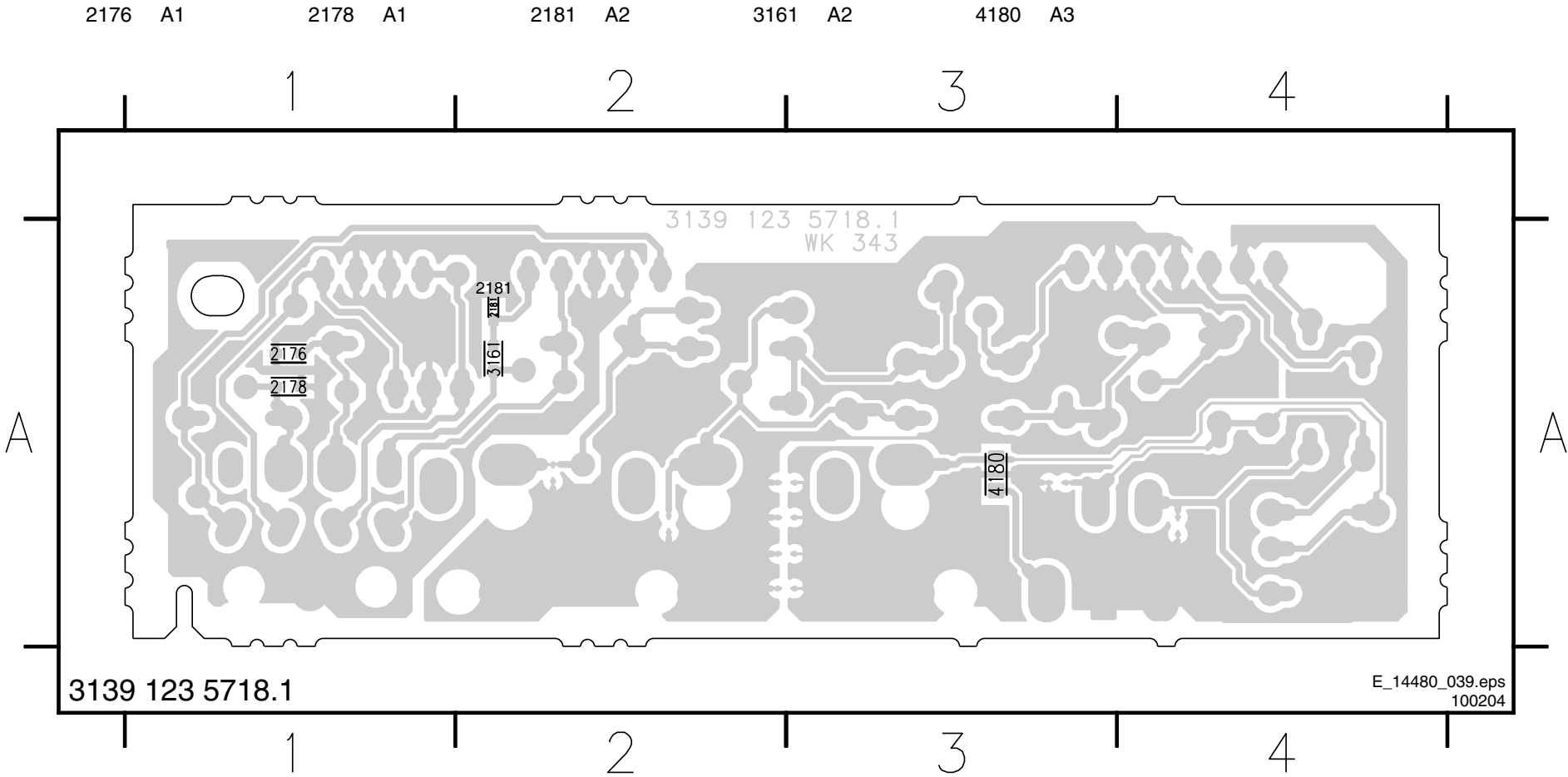
D SIDE AV PANEL + HP PANEL



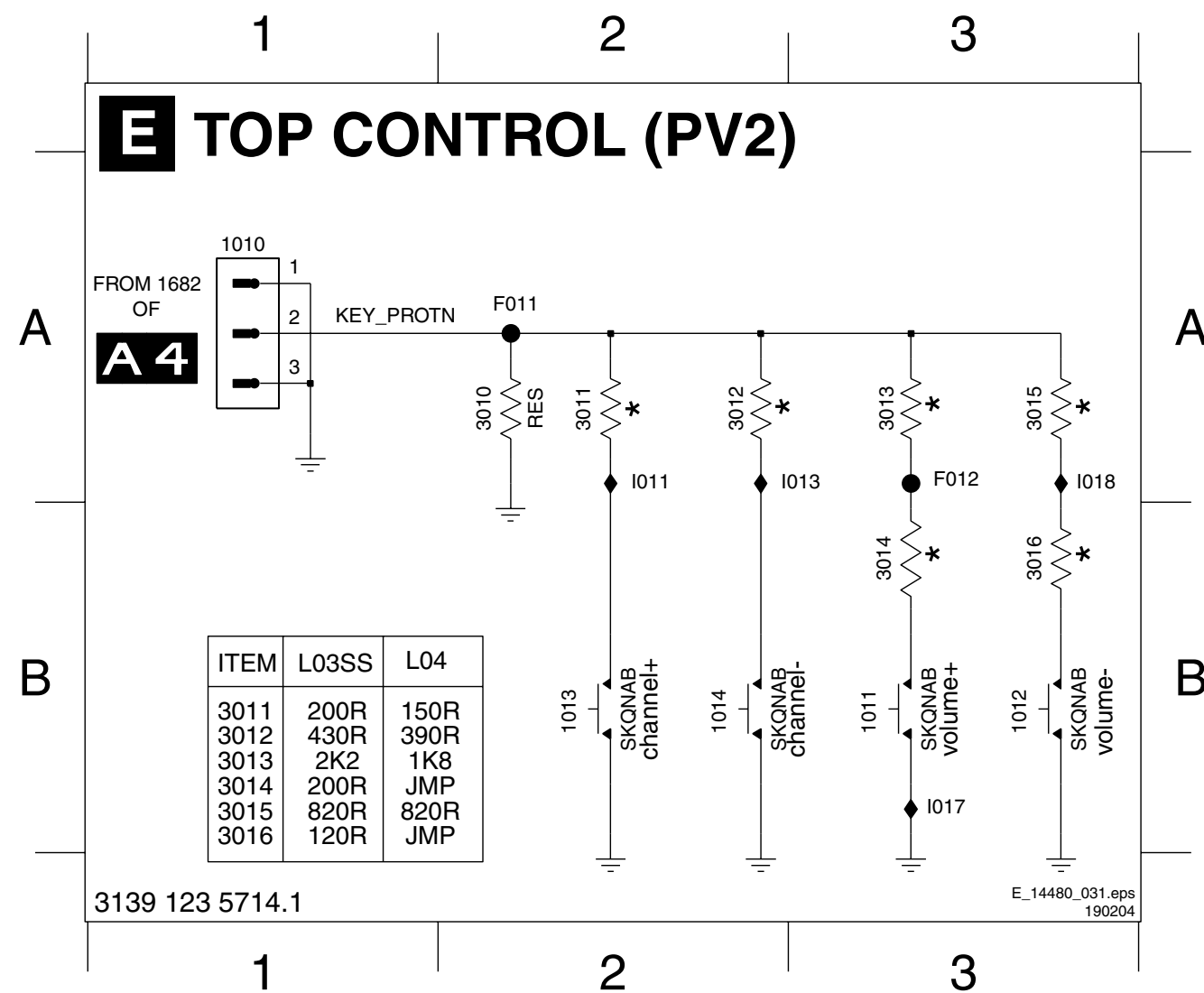
Layout Side AV + Headphone Panel (Top Side)



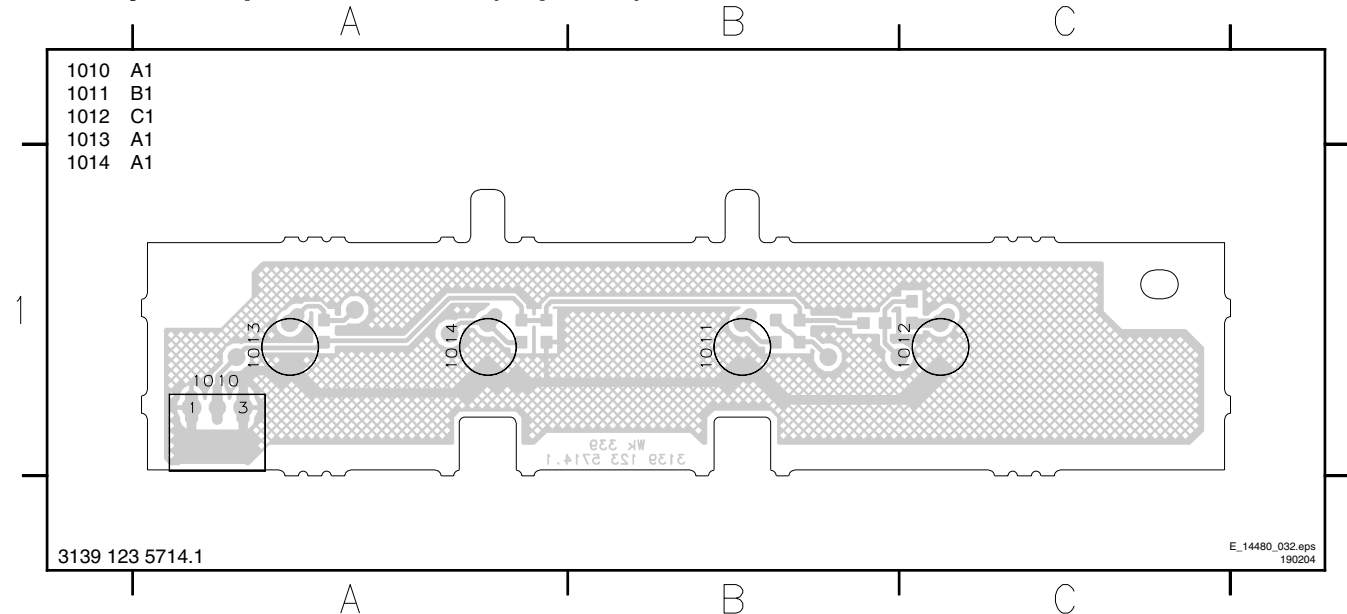
Layout Side AV + Headphone Panel (Bottom Side)



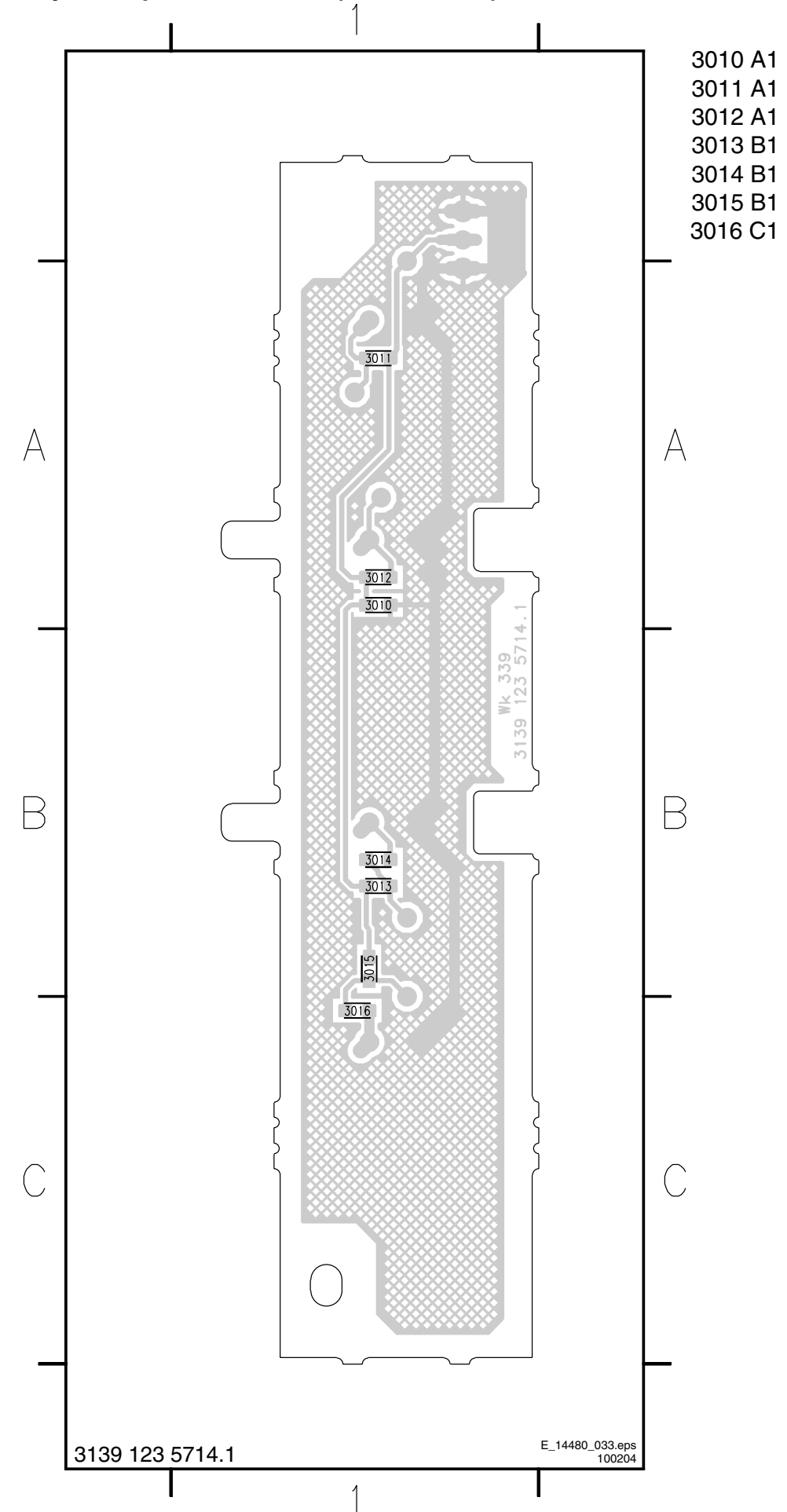
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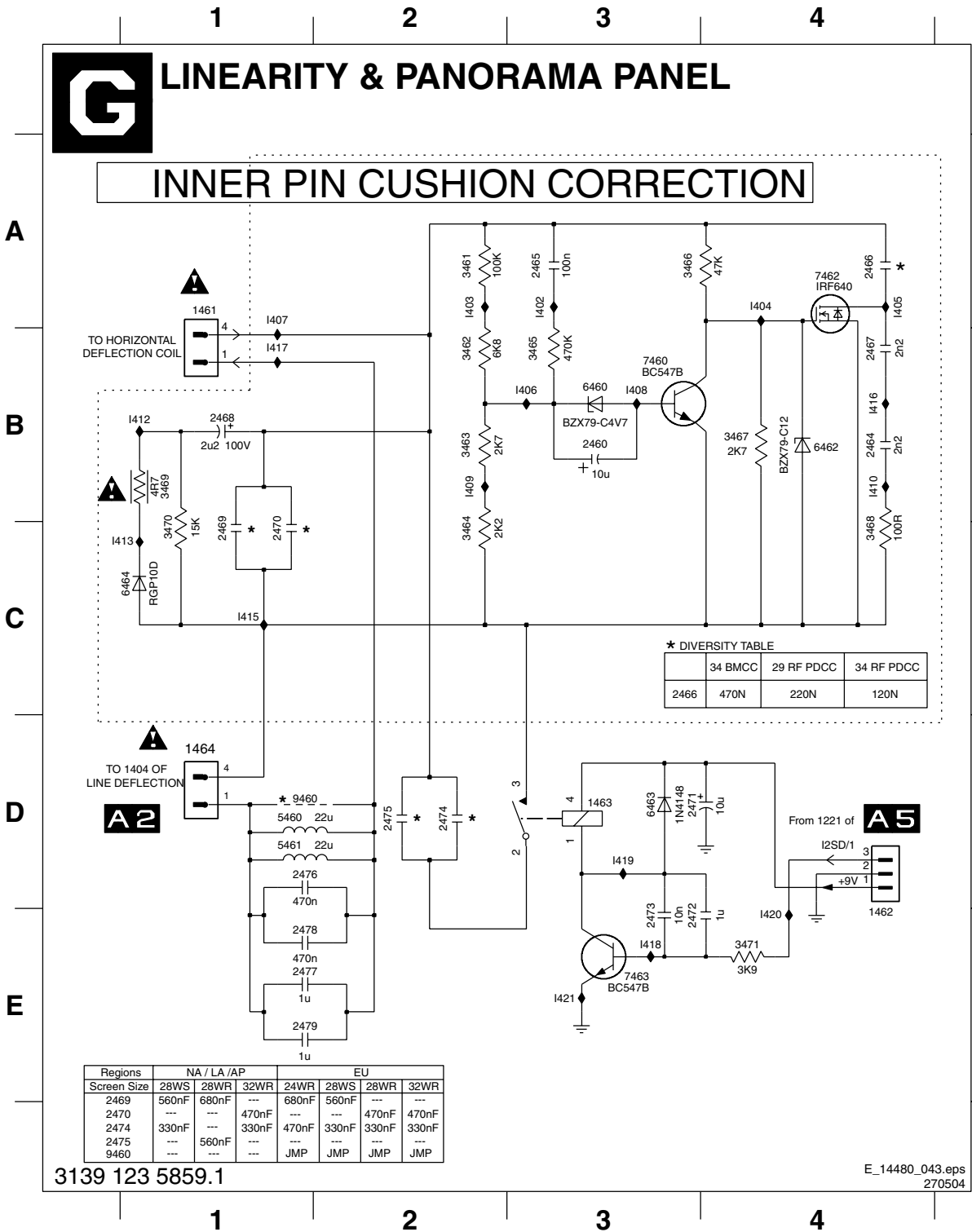
Layout Top Control Panel (Top Side)



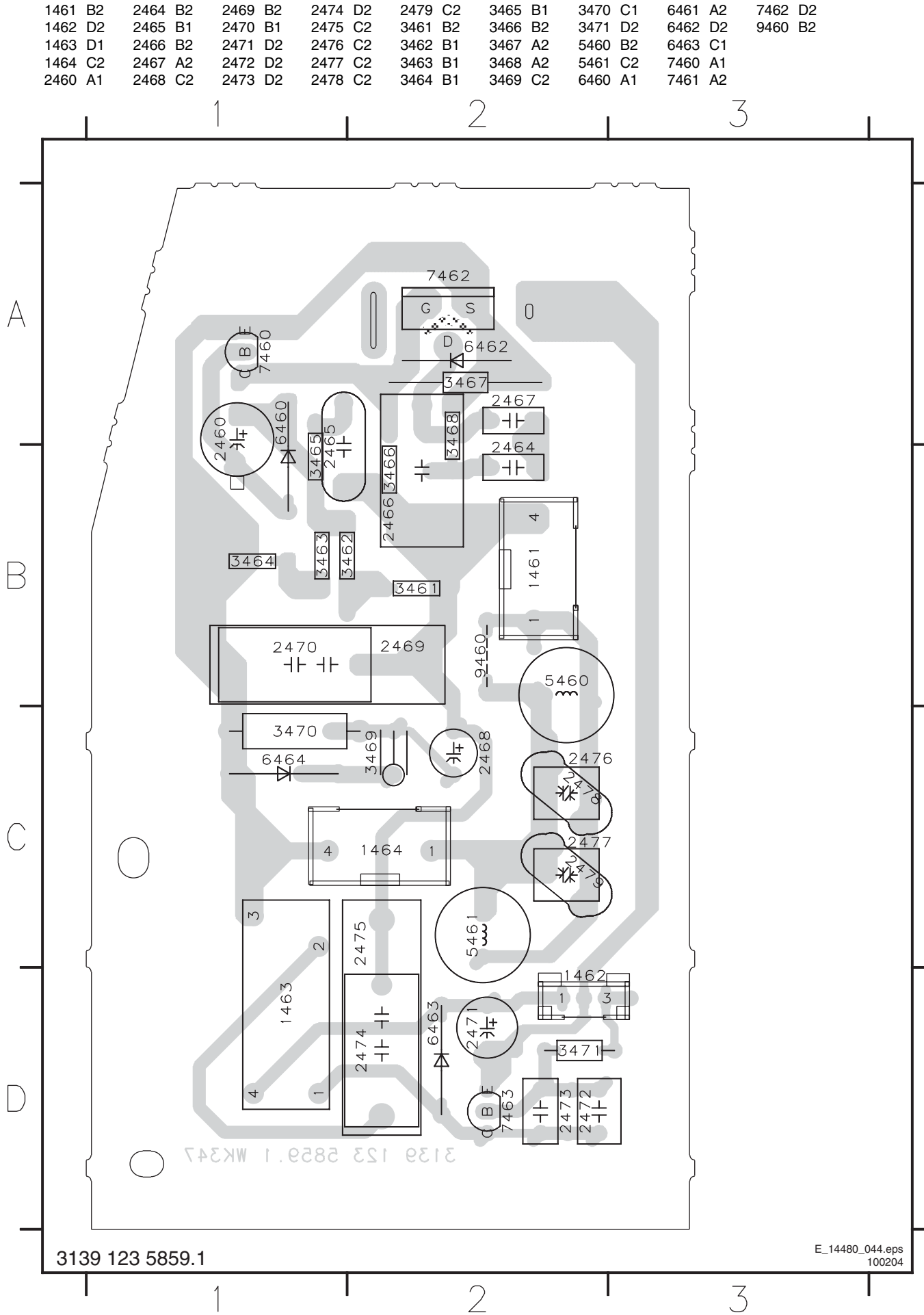
Layout Top Control Panel (Bottom Side)



Linearity & Panorama Panel



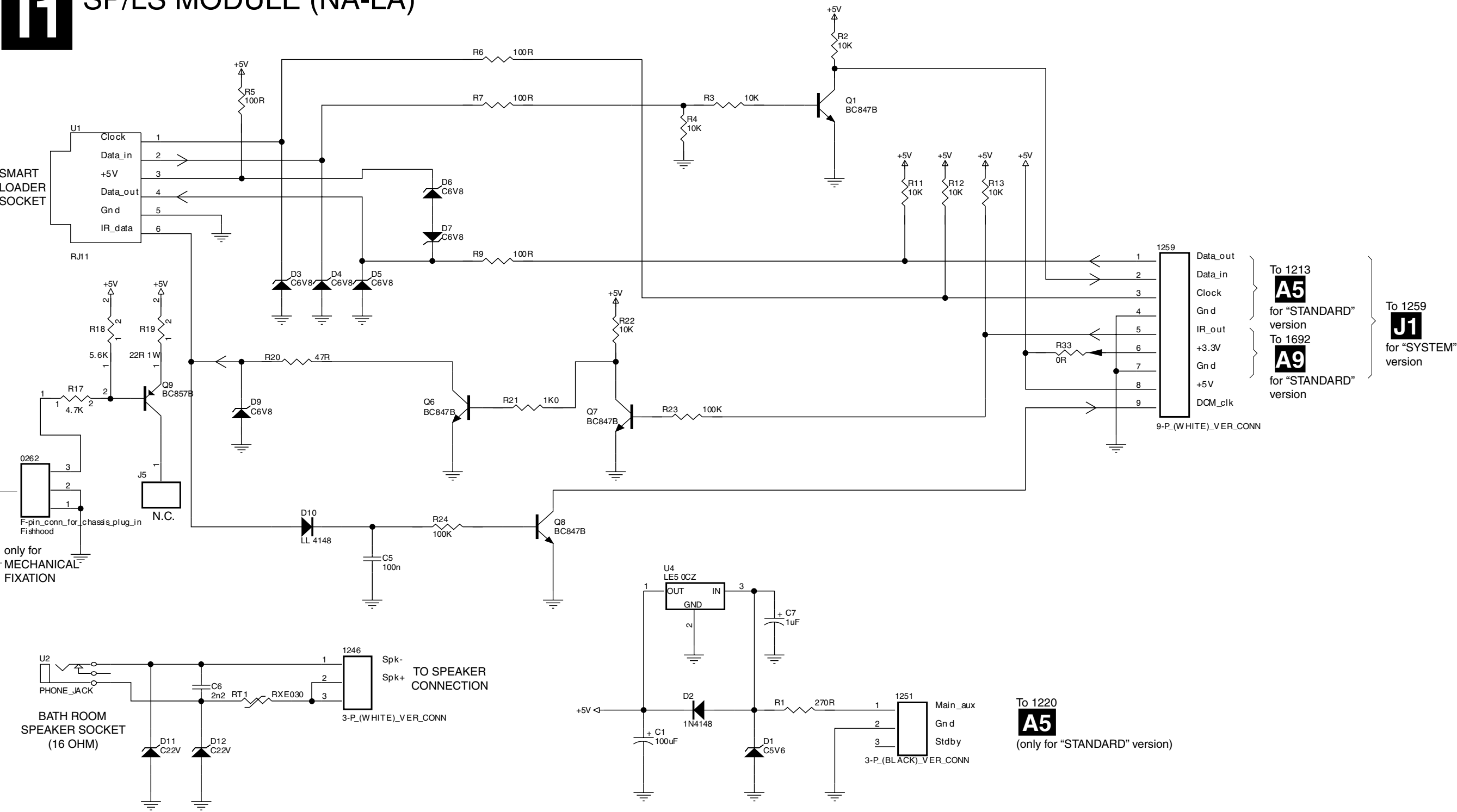
Layout Linearity & Panorama Panel (Top Side)



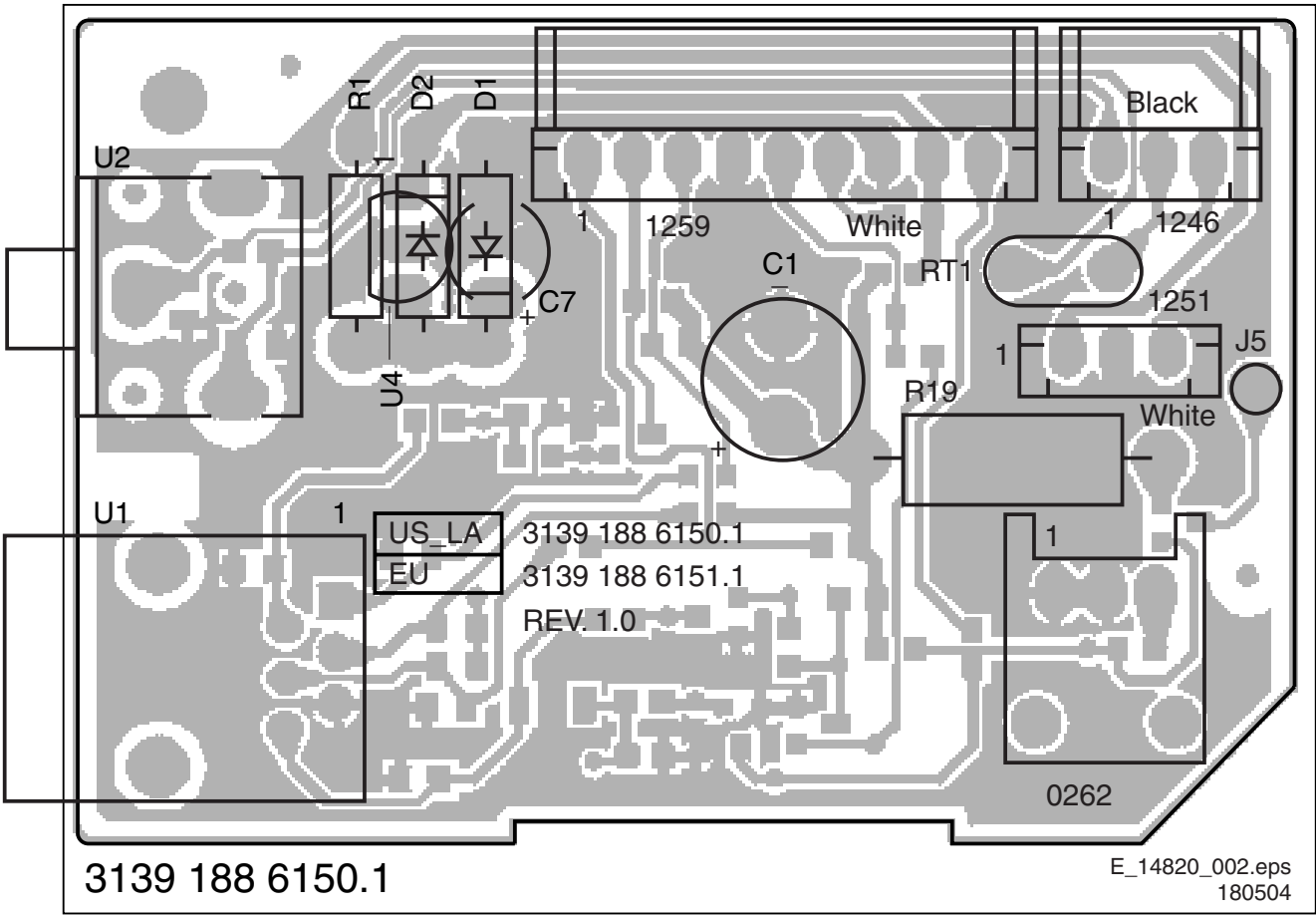
SP/LS Module (NA-LA)

11

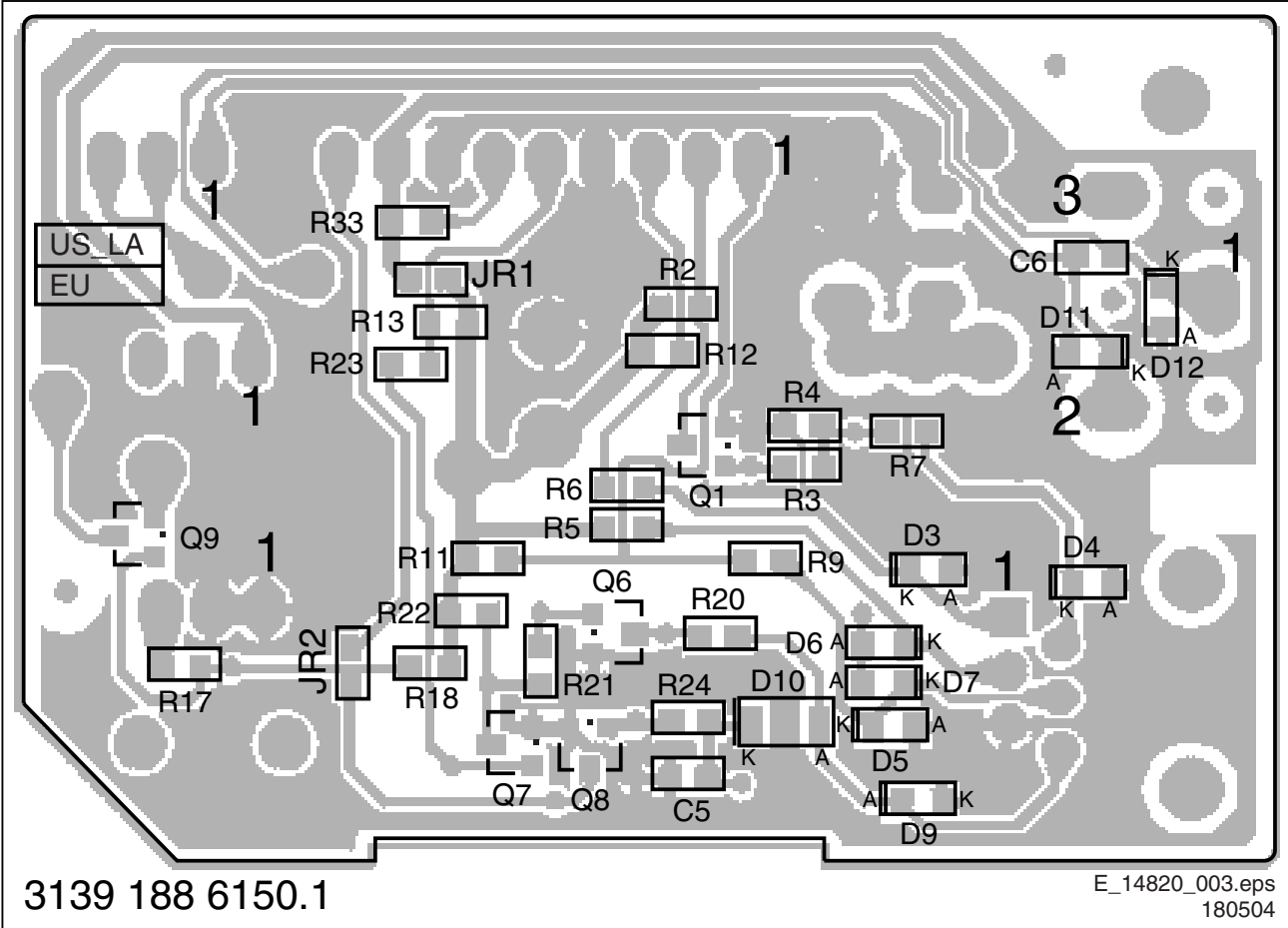
SP/LS MODULE (NA-LA)



Layout SP/LS Module (NA-LA) (Top Side)



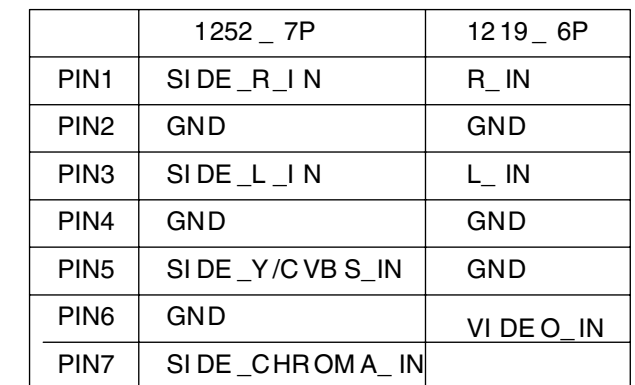
Layout SP/LS Module (NA-LA) (Bottom Side)



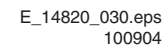
Personal Notes:

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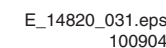
I2 FRONT AV MODULE



Layout Front AV Module (Top Side)

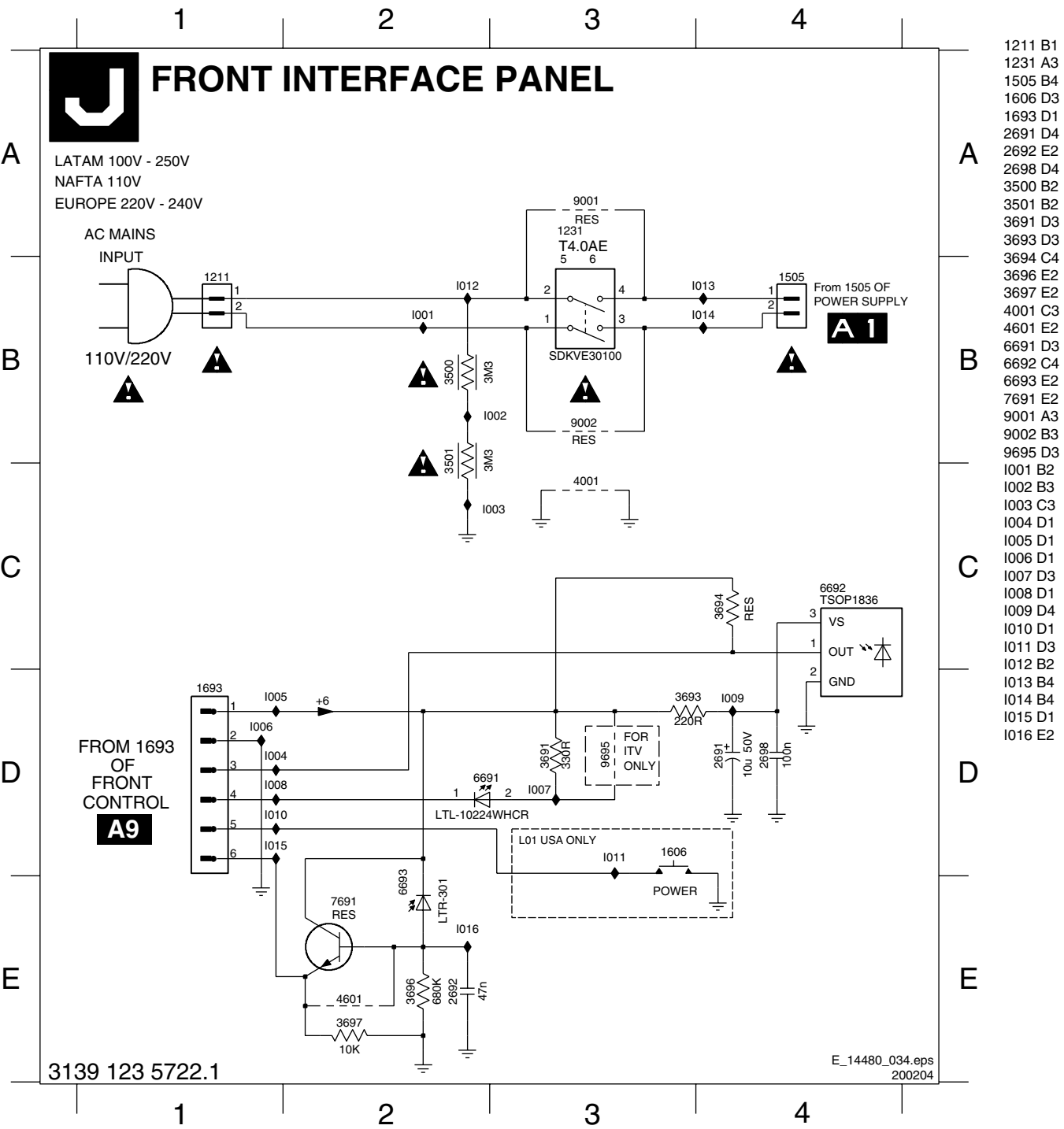


Layout Front AV Module (Bottom Side)

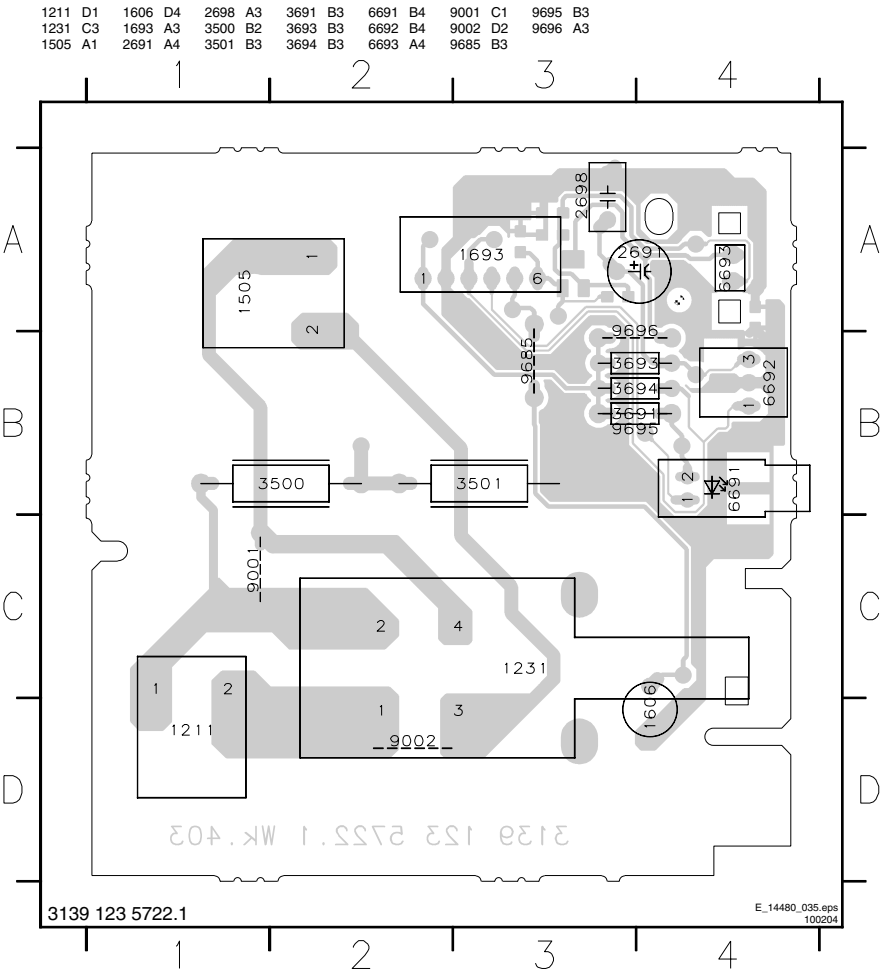


Personal Notes:

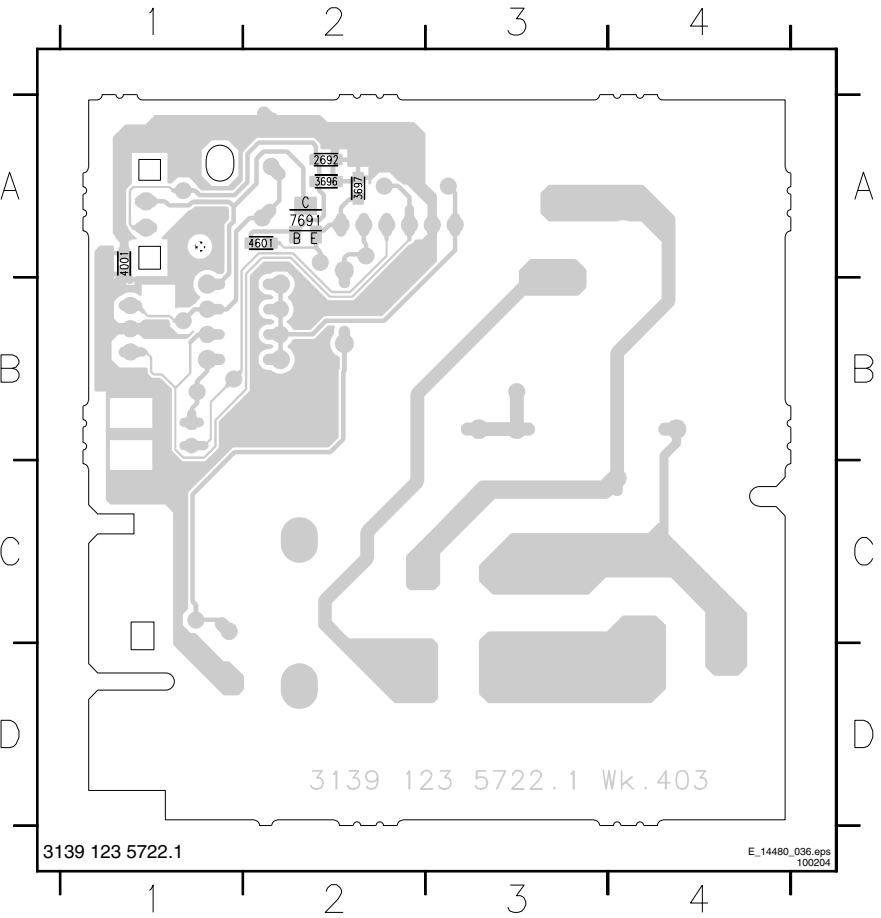
Front Interface Panel



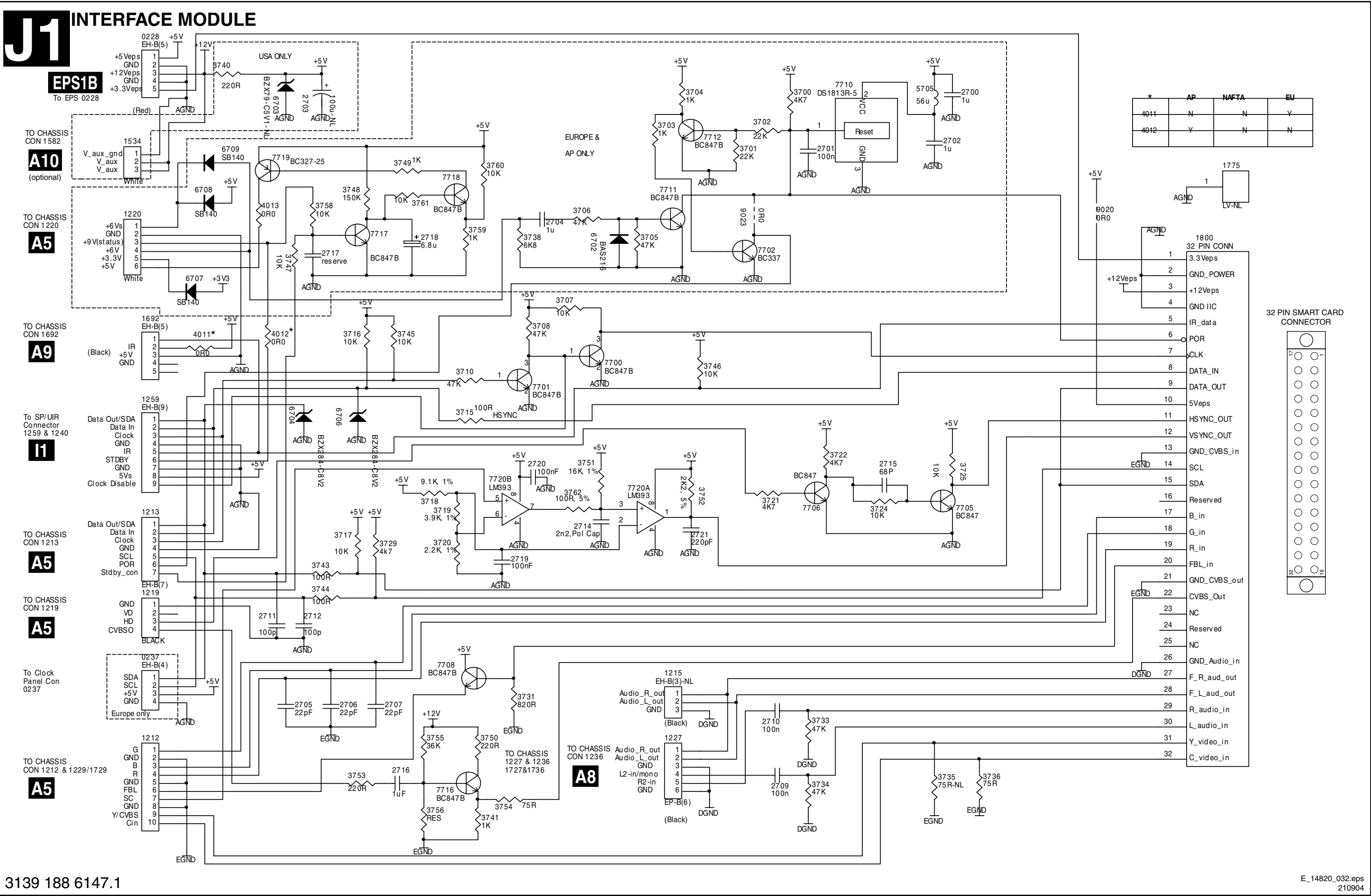
Layout Front Interface Panel (Top Side)



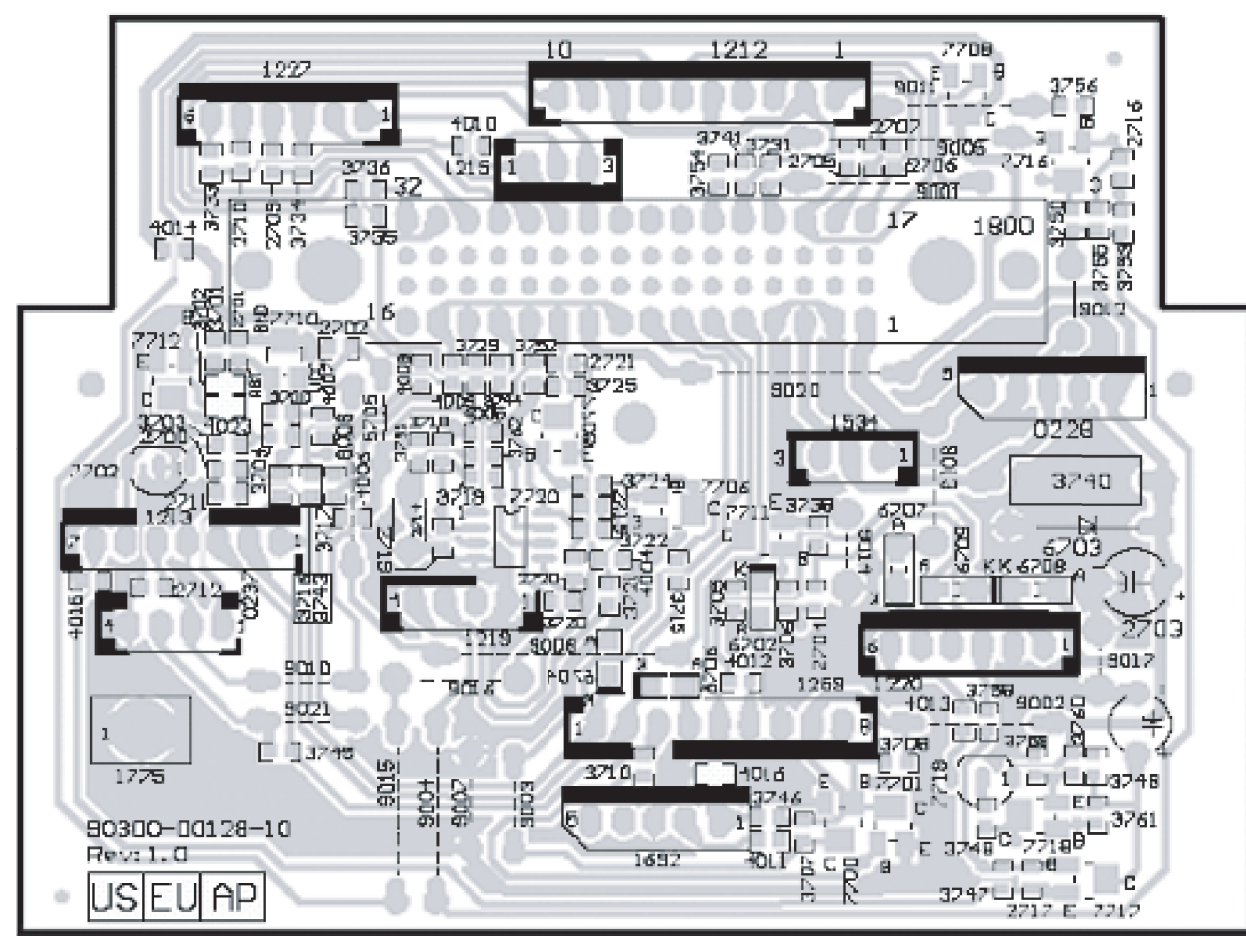
Layout Front Interface Panel (Bottom Side)



Interface Module



Layout Interface Module (Bottom Side)



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8. Alignments

Index of this chapter:

1. General Alignment Conditions
2. Hardware Alignments
3. Software Alignments and Settings

Note:

- The Service Default and Alignment Mode (SDAM) is described in chapter 5 “Service Modes, ...”.
- Menu navigation is done with the CURSOR UP, DOWN, LEFT, or RIGHT keys of the remote control transmitter.

8.1 General Alignment Conditions

Perform all electrical adjustments under the following conditions:

- AC voltage and frequency: 120 V_{ac} / 60 Hz or 240 V_{ac} / 50 Hz (region dependent).
- Connect the set to the AC power (a.k.a. Mains voltage) via an isolation transformer with a low internal resistance.
- Allow the set to warm up for approximately 20 minutes.
- Measure the voltages and waveforms in relation to chassis ground (with the exception of the voltages on the primary side of the power supply). Never use the cooling fins / plates as ground.
- Test probe: $R_i > 10 \text{ Mohm}$; $C_i < 2.5 \text{ pF}$.
- Use an isolated trimmer / screwdriver to perform the alignments.

8.2 Hardware Alignments

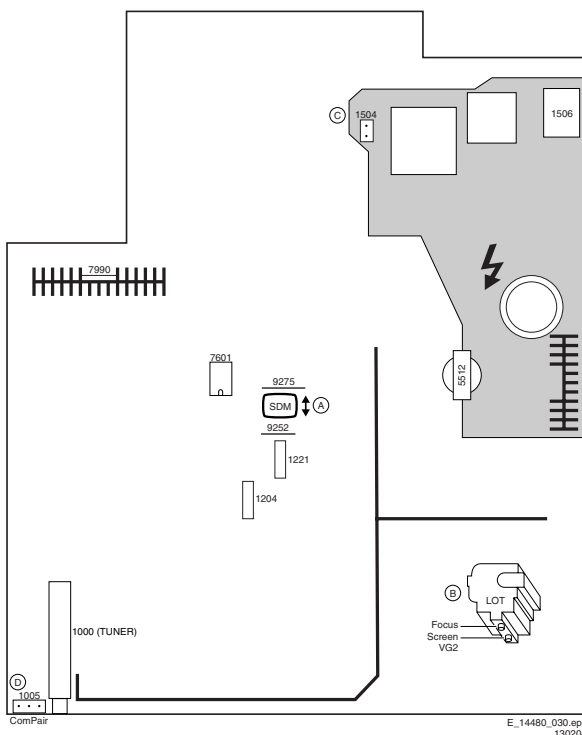


Figure 8-1 Top view family board

8.2.1 Vg2 Adjustment

1. Activate the SAM.
2. Go to the WHITE TONE sub menu.
3. Set the values of NORMAL RED, GREEN and BLUE to “32”.
4. Go, via the MENU key, to the normal user menu and set
5. SATURATION/COLOR to “0”.

6. CONTRAST to “0”.
7. BRIGHTNESS to minimum (OSD just visible).
8. Return to the SAM via the MENU key.
9. Connect the RF output of a pattern generator to the antenna input. Test pattern is a 'black' picture (blank screen on CRT without any OSD info) with a signal strength of 1 V_{pp}.
10. Set the channel of the oscilloscope to 50 V/div and the time base to 0.2 ms (external triggering on the vertical pulse). Ground the scope at the CRT panel and connect a 10:1 probe to one of the cathodes of the picture tube socket (see diagram B).
11. Measure the cut off pulse during first full line after the frame blanking (see figure “V_{cutoff} waveform”). You will see two pulses, one being the “cut off” pulse and the other being the “white drive” pulse. Choose the one with the lowest value; this is the “cut off” pulse.
12. Select the cathode with the highest V_{dc} value for the alignment. Adjust the V_{cutoff} of this gun with the SCREEN potentiometer (see figure “Top view family board”) on the LOT to 160 V_{dc}, except for the 25/28BLD picture tube (Black Line Display, for EU only); this tube must be aligned to 140 V_{dc}.
13. Restore BRIGHTNESS and CONTRAST to normal (= 31).

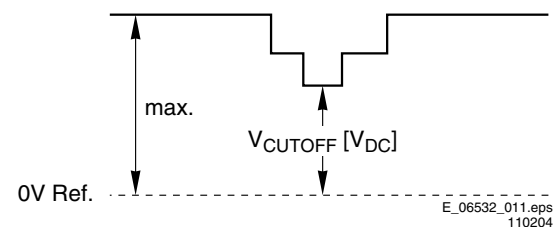


Figure 8-2 V_{cutoff} waveform

8.2.2 Focusing

1. Tune the set to a circle or crosshatch test pattern (use an external video pattern generator).
2. Choose picture mode NATURAL (or MOVIES) with the SMART PICTURE button on the remote control transmitter.
3. Adjust the FOCUS potentiometer (see figure “Top view family board”) until the vertical lines at 2/3 from east and west, at the height of the centerline, are of minimum width without visible haze.

8.3 Software Alignments and Settings

Enter the Service Default Alignment Mode (see chapter 5). The SDAM menu will now appear on the screen.

Select one of the following alignments:

1. OPTIONS
2. DEFLECTION
3. TUNER
4. WHITE TONE
5. GEOMETRY

8.3.1 Options

Table 8-1 Option Menu

LLLL	AAAABC	X.Y	S
ERR	XX	XX XX XX XX	
OP	XXX	XXX XXX XXX XXX XXX	
OB0			XXX
OB1			XXX
OB2			XXX
OB3			XXX
OB4			XXX
OB5			XXX
OB6			XXX
LOAD DEFAULT			>
WATCHDOG			ON / OFF
PROTECTION			ON / OFF
CHANNEL RING			ON/OFF
SOUND		NONE / 3415 / 3465	
QSS			ON / OFF
SPI I2C			ON/OFF
EW			ON/OFF
COMB FILTER			ON/OFF
SCAVEM			ON/OFF
SOFT CLIPPER			ON/OFF
ROTATION			ON / OFF
TUNER		NONE / APLS / PHILIPS	
OSD FRONT			ON / OFF
INTERFACE			ON / OFF
WSL		NONE / 4136 / 1836	
AV1			ON / OFF
AUX			ON / OFF
FRONT			ON / OFF
S-VIDEO			ON / OFF
CVI			ON / OFF
AV3YC			ON / OFF
NO IDENT STANDBY			ON / OFF

Options are used to control the presence / absence of certain features and hardware.

How to change an Option Byte

An Option Byte represents a number of different options. Changing these bytes directly makes it possible to set all options very fast. All options are controlled via seven option bytes. Select the option byte (OB1.. OB7) with the MENU UP/ DOWN keys, and enter the new value.

Leaving the OPTION submenu and switching the set off with the standby button on the remote saves the changes in the Option Byte settings. Some changes will only take effect after the set has been switched OFF and ON with the AC power switch (cold start).

How to calculate the value of an Option Byte

Calculate an Option Byte value (OB1 .. OB7) in the following way:

1. Check the status of the single option bits (OP): are they enabled (1) or disabled (0).
2. When an option bit is enabled (1) it represents a certain value (see first column 'value between brackets' in first table below). When an option bit is disabled, its value is 0.
3. The total value of an Option Byte is formed by the sum of its eight option bits. See second table below for the correct Option Bytes per typenumber.

Table 8-2 Option Bytes

Bit(value)	OB1	OB2	OB3	OB4	OB5	OB6	OB7
0 (1)	OP10	OP20	OP30	OP40	OP50	OP60	OP70
1 (2)	OP11	OP21	OP31	OP41	OP51	OP61	OP71
2 (4)	OP12	OP22	OP32	OP42	OP52	OP62	OP72
3 (8)	OP13	OP23	OP33	OP43	OP53	OP63	OP73
4 (16)	OP14	OP24	OP34	OP44	OP54	OP64	OP74
5 (32)	OP15	OP25	OP35	OP45	OP55	OP65	OP75
6 (64)	OP16	OP26	OP36	OP46	OP56	OP66	OP76
7 (128)	OP17	OP27	OP37	OP47	OP57	OP67	OP77
Total:	Sum	Sum	Sum	Sum	Sum	Sum	Sum

Option Bit Assignment

Following are the option bit assignments for all L01 ITV software clusters.

Table 8-3

Options	Bit	Description	Value
Byte 0	7	Not Used	
(TV System)	6		
	5		
	4	Default sound	1 = BG (or West EU), 2 = I (or UK), 3 = DK (or East EU), 4 = M, 5 = LL (or France)
	3		
	2		
	1	Sound Board	0 = Mono (no sound board), 1 = Mult Stereo, 2 = BTSC Stereo, 3 = AV stereo
	0		
Byte 1	7	Not Used	
(Pin Usage)	6	WideScreen	1 = 16:9 set
	5	Rotation	1 = Rotation On
	4	QSS	1 = UOC and chasis support QSS
	3	Uir Msg	1 = Uir Msg supported
	2	SPI I2C	1 = I2C at 32-pin card interface
	1	Not Used	
	0	Not Used	
Byte 2	7	SCAVEM	1 = SCAVEM is supported
(Devices)	6	Comb Filter	1 = Comb filter is available
	5	EW	1 = Chasis supports East-West alignment
	4	OSD Front	1 = Show "FRONT" for AV3, 0 = Show "Side" for AV3
	3	Radio	1 = Tuner has FM radio feature and TV chasis support FM radio
	2	LNA	1 = Tuner has LNA feature
	1	Tuner	0 = None (no tuner), 1 = Philips (model), 2 = Alps (model)
	0		
Byte 3	7	Not Used	
(Devices)	6	Soft Clipper	1 = Soft Clipper on
	5	Not Used	
	4	Not Used	
	3	SmartPort	1 = Chasis supports SmartPort (SPI or I2C)
	2	Active-Off LED	1 = LED ON
	1	WSL	0 = None (no used), 1 = 4136 (IR receiver model), 2 = 1836 (IR receiver model)
	0		
Byte 4	7	Not Used	
(AV, Tuning)	6	AV3YC	1 = AV3YC available
	5	CVI	1 = CVI available
	4	AV2YC	1 = AV available
	3	AV3	1 = AV available
	2	AV2	1 = AV available
	1	AV1	1 = AV available
	0	RGB	0 = RGB input always allowed, 1 = RGB insertion allowed only when current input source is AV1
Byte 5	7	ITV Ring	1 = ITV Ring available
(Feature)	6	Protection	1 = Protection (TV go to standby). 0 = No protection but errors are still logged.
	5	WatchDog	1 = Watchdog feature is enabled
	4	No Ident Standby	1 = TV goes standby after 10mins of no RF signal.
	3	Buzzer Type	0 = None (no buzzer), 1 = Internal (generated by TV microp), 2 = External (generated by I2C device)
	2		
	1	Clock Type	0 = None (no clock), 1 = OSD, 2 = LED Module
	0		
Byte 6	7	Not Used	
(Power)	6	Not Used	
	5	Not Used	
	4	Not Used	
	3	Not Used	
	2	Not Used	
	1	Card Power	0 = No card reset, 1 = Card reset at once, 2 = Card reset upon HW reset always,
	0		3 = Card reset upon HW, but only when POR monitored

8.3.2 Deflection

The Deflection Sub menu contains the following items:

- **AKB ON** to enable, OFF to disable the 'black current loop' (AKB = Auto Kine Bias).
 - **Brightness** (set Brightness)
 - **Contrast** (set Contrast)
- "See VG2 alignment"

8.3.3 Tuner

The Tuner Sub menu contains the following items:

Note: Described alignments are only necessary when the NVM (item 7602) is replaced.

IF PLL

Phase Locked Loop Used for FST tuning systems.

Adjust the IFPLL value (**default value is 30**) with the LEFT/RIGHT cursor keys.

AGC (AGC take over point)

Set the external pattern generator to a colour bar video signal and connect the RF output to aerial input. Set amplitude to 10 mV and set frequency to 475.25 MHz (PAL). Connect a DC multimeter to pin 1 of the tuner (item 1000 on the main panel).

1. Activate the SDAM.
2. Go to the TUNER sub menu.
3. Select AGC with the UP/DOWN cursor keys.
4. Adjust the AGC-value (**default value is 28**) with the LEFT/RIGHT cursor keys until the voltage at pin 1 of the tuner lies between 3.8 and 2.3 V.
5. Switch the set to STANDBY.

SL (Slicing level)

Slicing level for vertical sync

This adjustment is always set to 0 (for NTSC system only).

CFA0

Comb Filter forced mode.

This adjustment is always set to OFF.

CL (cathode drive level)

Adjust the CL value (**default value is 4**) with the LEFT/RIGHT cursor keys.

YD

Y-delay adjustment.

This is a fixed value, always set to 7.

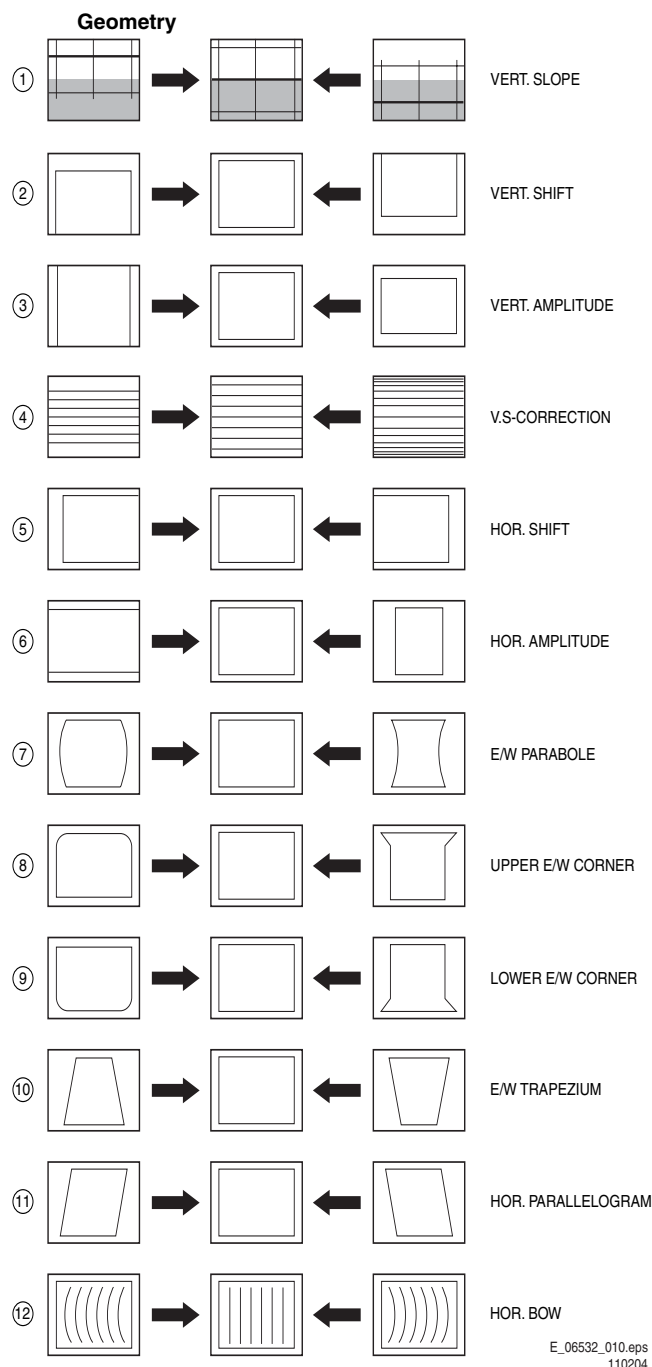
8.3.4 White Tone

In the WHITE TONE sub menu, the values of the black cut off level can be adjusted. Normally, no alignment is needed for the WHITE TONE. You can use the given default values.

The colour temperature mode (NORMAL, COOL and WARM) and the colour (RED, GREEN, and BLUE) can be selected with the UP/DOWN RIGHT/LEFT cursor keys. The value can be changed with the LEFT/RIGHT cursor keys. First, select the values for the NORMAL colour temperature. Then select the values for the DELTA COOL and DELTA WARM mode. After alignment, switch the set to standby, in order to store the alignments.

8.3.5 Geometry

The geometry alignments menu contains several items to align the set, in order to obtain correct picture geometry.



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110204

Figure 8-3

Connect an external video pattern generator to the aerial input of the TV-set and input a crosshatch test pattern. Set the generator amplitude to at least 1 mV and set frequency to 61.25 MHz (NTSC).

1. Activate the SDAM menu (see chapter 5).
2. Go to the GEOMETRY sub menu.

Now you can perform the following alignments:

- **Horizontal Parallelogram (HP)** Align straight vertical lines in the top and the bottom; vertical rotation around the centre.
- **Horizontal Bow (HB)** Align straight horizontal lines in the top and the bottom; horizontal rotation around the centre.
- **Horizontal Shift (HS)** Align the horizontal centre of the picture to the horizontal centre of the CRT.
- **Vertical slope (VS)** Align the vertical centre of the picture to the vertical centre of the CRT. This is the first of the vertical alignments to perform. For an easy alignment, set SBL to ON.

- **Vertical Amplitude (VA)** Align the vertical amplitude so that the complete test pattern is visible.
- **Vertical S-Correction (SC)** Align the vertical linearity, meaning that vertical interval of a grid pattern must be equal over the entire screen height.
- **Vertical Shift (VSH)** Align the vertical centring so that the test pattern is located vertically in the middle. Repeat the 'vertical amplitude' alignment if necessary.
- **Service blanking (SBL)** Switch the blanking of the lower half of the screen ON or OFF (to be used in combination with the vertical slope alignment).

For EW versions :

- Set Horizontal Parallelogram **HP** to prevent the picture from slanting to one side.
- Set Horizontal Bow **HB** to prevent the top and bottom of picture from bending to the sides.
- Select Vertical Zoom **VX** to align the vertical linearity over the entire screen height (for 16 : 9 applications only).
- Set Trapezium Correction **TC** to align the lines at the vertical sides.
- Select East-West Width **EW** and align the picture width until the side castellations disappear.
- Select East-West Parabola / width **PW** and align the vertical sides until the sides are straightened.
- Select Upper Corner Parabola **UCP** to straighten the top of the vertical lines at the sides.
- Select Lower Corner Parabola **LCP** to straighten the bottom of the vertical lines at the sides.
- Repeat the last 5 steps if necessary.

9. Circuit Descriptions, List of Abbreviations, and IC Data Sheets

Index of this chapter:

- 1. Introduction
- 2. Power Supply
- 3. Deflection
- 4. Control
- 5. Tuner and IF
- 6. Source Selection
- 7. Audio
- 8. Video
- 9. Abbreviations
- 10. IC Data Sheets

Notes:

- Only **new** circuits compared to the M8 (L01.1 for other regions) chassis are described in this chapter. For the other circuit descriptions, see the manual of the M8 (L01.1) chassis.
- Figures can deviate slightly from the actual situation, due to different set executions.
- For a good understanding of the following circuit descriptions, please use the diagrams in sections “Block Diagrams, ...”, and/or “Electrical Diagrams”. Where necessary, you will find a separate drawing for clarification.

9.1 Introduction

The "L04" chassis is a global TV chassis for the model year 2004 and is used for TV sets with large screen sizes (from 21 to 36 inch), in Super Flat and Real Flat executions (both in 4:3 and 16:9 variants).

There are three types of CRT namely the 100 degrees, 110 degrees and Wide Screen CRT.

- The 100 deg. 4:3 CRT is raster-correction-free and does not need East/West Correction (except when used in AP regions), therefore the corrections needed are Horizontal Shift, Vertical Slope, Vertical Amplitude, Vertical S-Correction, Vertical Shift, and Vertical Zoom for geometry corrections.
- The 110 deg. 4:3 CRT comes with East/West Correction. In addition to the parameter mentioned above, it also needs the Horizontal Parallelogram, Horizontal Bow, Horizontal Shift, East/West Width, East/West Parabola, East/West Upper and Lower Corners, and East/West Trapezium correction.
- The Wide Screen TV sets have all the correction of the 110 deg. 4:3 CRTs and also have additional picture format like the 4:3 format, 16:9, 14:9, 16:9 zoom, subtitle zoom, and the Super-Wide picture format.

In comparison to its predecessor (the M8/L01.1), this chassis is has the following (new) features:

- Audio: The sound processor is part of the UOC processor (called “Hercules”).
- Video: Enhanced video features, video drivers, and Active Control.
- Control: Comparable to M8/L01.1 (e.g. Dual clock, I/O mapping, I/O switching).
- Power Supply: Adapted to supply the Hercules IC, and to enable 0.5 W Standby power dissipation. Also provisions are made for future extensions like DVD and iDTV.

The standard architecture consists of a Main panel (called “family board”), a Picture Tube panel, a Side I/O panel, and a Top Control panel. The Main panel consists primarily of conventional components with some surface mounted devices in the audio and video processing part.

The functions for video/audio processing, microprocessor (P), and CC/Teletext (TXT) decoder are all combined in one IC (TDA1200x, item 7200), the so-called third generation Ultimate One Chip (UOC-III) or “Hercules”. This chip is mounted on the “solder” side of the main panel, and has the following features:

- Control, small signal, mono/stereo, and extensive Audio/Video switching in one IC.
- Upgrade with digital sound & video processing.
- Alignment free IF, including SECAM-L/L1 and AM.
- FM sound 4.5/5.5/6.0/6.5, no traps/bandpass filters.
- Full multi-standard color decoder.
- One Xtal reference for all functions (microprocessor, RCP, TXT/CC, RDS, color decoder, and stereo sound processor).

The tuning system features 181 channels with on-screen display. The main tuning system uses a tuner, a microcomputer, and a memory IC mounted on the main panel. The microcomputer communicates with the memory IC, the customer keyboard, remote receiver, tuner, signal processor IC and the audio output IC via the I2C bus. The memory IC retains the settings for favorite stations, customer-preferred settings, and service / factory data. The on-screen graphics and closed caption decoding are done within the microprocessor where they are added to the main signal.

The chassis uses a Switching Mode Power Supply (SMPS) for the main voltage source. The chassis has a ‘hot’ ground reference on the primary side and a cold ground reference on the secondary side of the power supply and the rest of the chassis.

9.2 Power Supply

9.2.1 Block Diagram

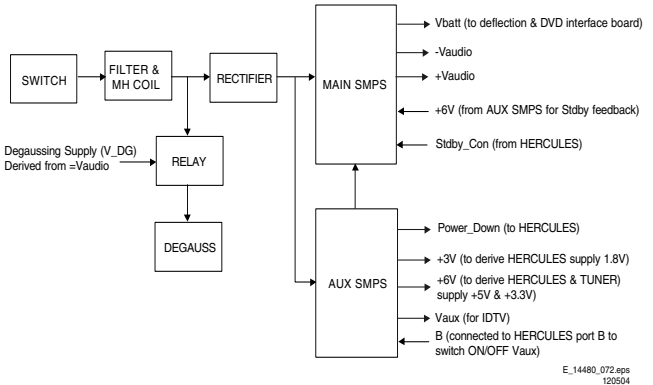


Figure 9-1 Block diagram power supply

Stdbby_con signal

The Hercules generates this signal. This line is logic “low” (0 V) under normal operation and in semi-Standby of the TV, and is “high” (3.3 V) during Standby.

Power_down signal

The AUX SMPS generates this signal. It is logic “high” (3.3 V) under normal operation of the TV and goes “low” (0 V) when the AC power (or Mains) input voltage supply goes below 70 V_{ac}.

B (Hercules port)

This port is used to switch the AUX SMPS output V_{aux} “On/Off”. This is required for DVD and iDTV (for future extensions).

9.2.2 Timing Diagrams

Power ON - To Standby - Out of Standby - Power OFF

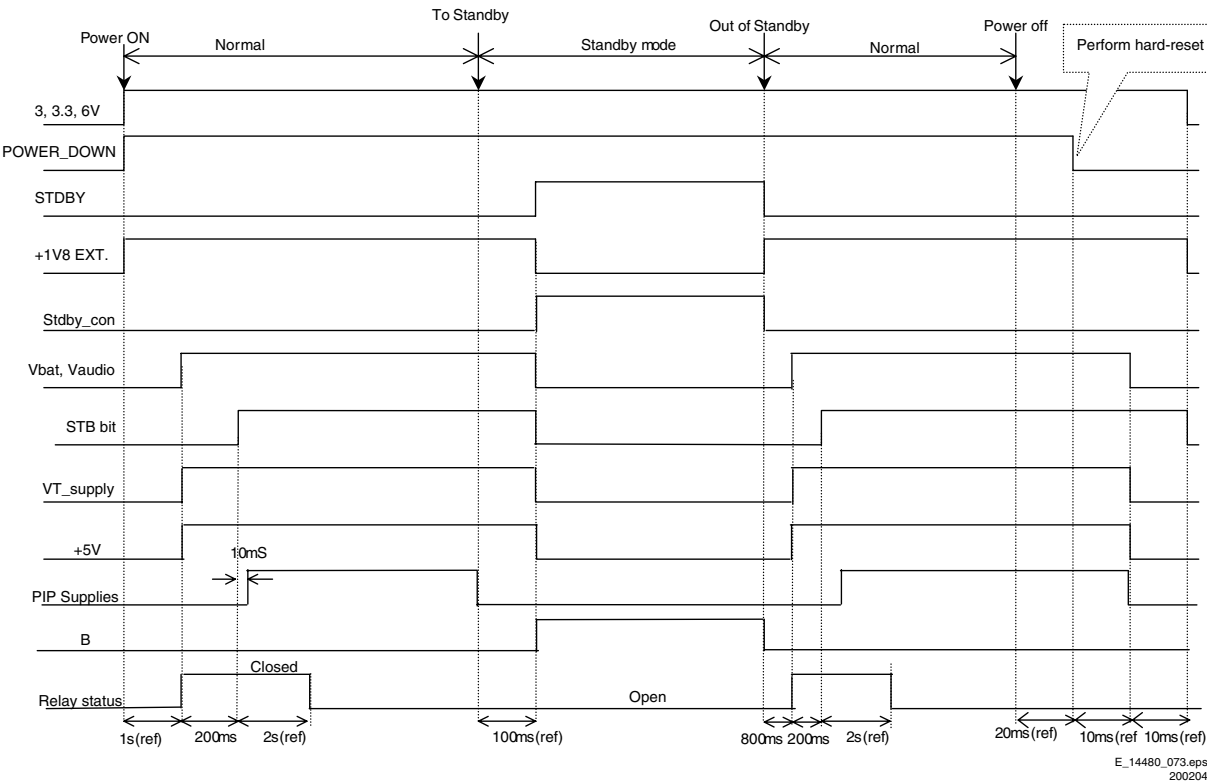


Figure 9-2 Timing diagram Standby

Power ON - To Semi Standby - Out of Semi Standby - Power OFF

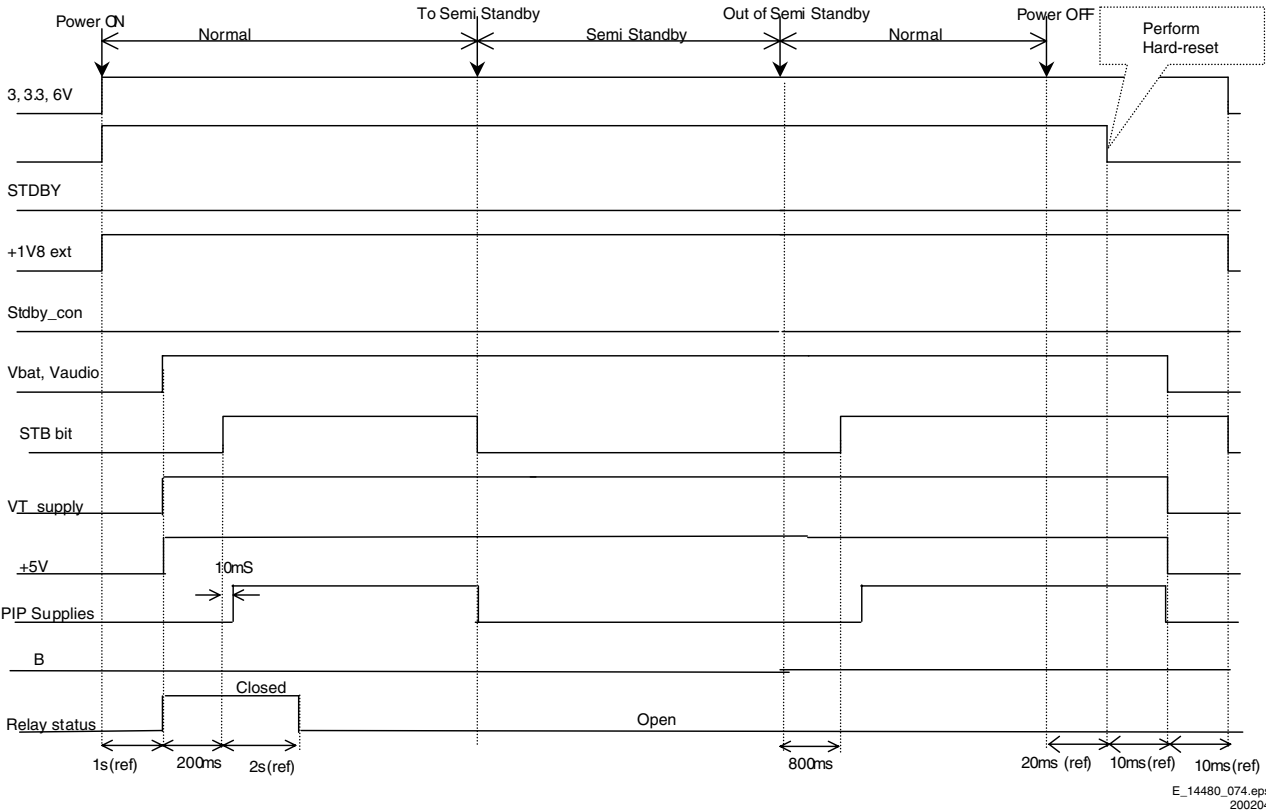


Figure 9-3 Timing diagram Semi Standby

9.2.3 Startup Sequence

When the set is connected to the AC power, the rectified line voltage (via winding 4-5 of L5531 connected to pin 14 of IC7531) will start the internal voltage source to charge the V_{cc} capacitor (C2532). The IC starts to switch as soon as the V_{cc} reaches the V_{cc} start level of 9.5 V. This supply is automatically taken over by winding 1-2, as soon as the V_{cc} is high enough, and the internal supply source will stop (for high efficiency switching).

Table 9-1 Pinning overview TEA1523

Pin	Symbol	Description
2	Gnd	This pin is Ground of the IC.
3	V _{cc}	This pin is connected to the supply voltage. An internal current charges the V _{cc} capacitor (2532), and the start-up sequence is initiated when this voltage reaches a level of 9.5 V. Note: The output power is disabled when the voltage gets below 9 V (UVLO). Operating range is between 0 to 40 V.
5	RC	Frequency setting
6	REG	This pin is connected to the feedback loop. The pin contains two functions: 1) Between 1 to 1.425 V it controls the "on" time. 2) Above the threshold of 3.5 V, it is possible to initiate "burst mode" standby.
11	Demag	This pin is connected to the V _{cc} winding of 5531. It has three functions: 1) During Magnetisation, the input voltage is sensed to compensate OCP level for OPP. 2) During demagnetisation, the output voltage is sensed for OVP and 3) A comparator is used to prevent continuous conduction when output is overloaded.
12	Sense	This pin contains three different functions.: 1) Detection of soft start, protection levels of 2) OCP, and 3) SWP.
14	Drain	This pin is connected to the drain of the switch or center tap of the transformer. It contains three functions: 1) M-level (mains-dependent operation-enabling level), 2) Supply for start-up current, and 3) Valley detection.

As C2532 of IC7531 is charged, it will also start to charge the V_{cc} capacitor (C2511) of IC7511. Via resistor R3519 and C2511, the TEA1506 starts to switch as soon as the V_{cc} voltage reaches the V_{cc} start level of is about 11 V. The V_{cc} voltage is automatically taken over by the main transformer L5512 (winding 2-3) when the V_{cc} is high enough (when this voltage is even higher than the voltage on C2511, there is no current flow from C2532 to C2511 due to diode D6512).

Table 9-2 Pinning overview TEA1506

Pin	Symbol	Description
2	Vcc	This pin is connected to the supply voltage. When this voltage is high (V _{cc} start level, about 11 V), the IC will start switching. When the voltage is lower than V _{cc} uvlo (about 8.7 V), the IC will stop switching. Note: This pin is not self supplied by internal source like in TEA1507
3	Gnd	This pin is Ground of the IC.
6	Ctrl	This pin is connected to the feedback loop. The pin will control the "on" time between 1 V to 1.5 V.
7	Demag	This pin is connected to the Vcc winding of 5512. It contains three functions: 1) During magnetisation, the input voltage is sensed to compensate OCP level for OPP, 2) During demagnetisation, the output voltage is sensed for OVP and 3) a comparator is used to prevent continuous conduction when the output is overloaded.
9	Sense	This pin contains three different functions: 1) detection of soft start, protection levels of 2) OCP, and 3) SWP.
11	Driver	This pin will drive the (MOSFET) switch.
12	HVS	This is High Volt Spacer (n.a.)
14	Drain	Connected to the Drain of the external MOSFET switch, this is the input for valley sensing and initial internal supply.

9.2.4 Standby Mode

In this mode, IC7511 (TEA1506) will be totally disabled. So there is no voltage on the main transformer output. But IC7531 (TEA1523) will still work and will provide the necessary output voltages (6V -> 5V, 3.3V, 3V -> 1.8V) to the Hercules (IC7200).

Table 9-3 PSU voltage overview

Voltage	Normal operation	Stdby mode
V _{batt}	130 - 143 V	0 V
V _{audio}	+/- 15.5 V	0 V
+6V	6 V	6 V
+3V	3 V	3 V
Stdby _{con}	0 V	3.3 V

9.3 Deflection

9.3.1 Synchronization

Before the Hercules (IC7200) can generate horizontal drive pulses, the +3.3V supply voltages must be present. After the start up command of the microprocessor (via I2C), the Hercules outputs the horizontal pulses. These horizontal pulses begin "initially" with double line frequency and then change "gradually" to line frequency in order to limit the current in the line stage (slow-start).

The VDRA and VDRB signals are the balanced output currents (sawtooth shaped) of the frame oscillator (pins 106 and 107 of the Hercules). These output signals are balanced, so they are less sensitive to disturbances.

There is a current source inside the UOC at pin 102. This pumps energy in the capacitor connected to this pin producing a pure saw tooth. The vertical drive signals and the E/W correction signal are derived.

Pin 108 is the East-West drive (or AVL), and it is a single ended current output. The correction for "horizontal width for changed EHT" from this pin is available by setting the HCO bit to "1".

The Phase-2 Compensation available at pin 113 gives frame correction for high beam currents. The phase compensation signal is used to correct the phase of the picture from the horizontal drive signal.

Pin 63 is the SANDCASTLE output (contains all sync info) and also HORIZONTAL FLYBACK (HFB) input.
Pin 97 is the EHT tracking/over-voltage protection pin. The HCO bit can switch on the tracking on EW. If the voltage at pin 97 exceeds 3.9 V, the over-voltage protection will be activated and the horizontal drive is switched "off" via a slow stop.

9.3.2 Horizontal Deflection

- There are several executions (depending on the CRT):
- Sets with no East-West correction.** The principle of the horizontal deflection is based on the quasi-diode modulation circuit. This horizontal deflection circuit supplies the deflection current and auxiliary voltages from the LOT.
 - Sets with East-West correction.** The principle of the horizontal deflection is based on a diode modulator with east-west correction. This horizontal deflection circuit supplies the deflection current and auxiliary voltages from the LOT.
 - Sets with dynamic East-West correction.** The principle of the horizontal deflection is based on a diode modulator with dynamic east-west correction for picture tubes with inner pincushion. This horizontal deflection circuit supplies the deflection current and auxiliary voltages from the LOT.

Basic Principle

During a scan period, either the Line Transistor or diode(s) conduct to ensure a constant voltage over the deflection coil (that results in a linear current). During the flyback period, the Line Transistor stops conducting, and the flyback capacitor(s) together with the inductance of the deflection coil creates oscillation.

First Part of Scan

Pin 62 of the UOC delivers the horizontal drive signal for the Line Output stage. This signal is a square pulse of line frequency. L5402 is the flyback drive transformer. This transformer de-couples the line output stage from the UOC. It has a direct polarization. The flyback drive circuit works with the start-up supply taken from +6V of the Aux supply (and subsequently taking from VlotAux+9V). When the H-drive is high, TS7404 conducts, and transformer L5402 starts to store energy. The base of the line transistor TS7405 is low and therefore blocks. The current in the deflection coil returns from diode D6404.

Second Part of Scan

When the H-drive is low, TS7404 does not conduct, and the energy that is stored in the transformer will transfer to the secondary, making the base of the Line Transistor high. Then the Line Transistor starts to conduct. The current in the deflection coil returns from the transistor in another direction.

Flyback

At the moment the H-drive becomes high, the base of the Line Transistor becomes low. Both the Line Transistor and the Flyback Diode will block. There is an oscillation between the flyback capacitor C2412 and the deflection coil. Because of the inductance of the LOT, the Line Transistor cannot stop conducting immediately. After the Line Transistor is out of conduction, the flyback pulse is created. The flyback capacitor charges until the current in the deflection coil reduce to zero. Then it discharges through the deflection coil and the deflection current increases from the other direction. The flyback diode conducts and is back to the first part of the scan.

Linearity Correction

Because the deflection coil has a certain resistance, a picture without any linearity issues cannot be expected. L5401 is the linearity coil to compensate for this resistance. It is a coil with a pre-magnetized core. This correction is called linearity correction.

Horizontal S-Correction

Because the electronic beam needs to travel a longer distance to both sides of the screen than the center, the middle of the screen would become narrower than both sides. To prevent this, a parabolic voltage is applied across the deflection coil during scan. To create this parabolic voltage, a capacitor called S-cap (C2417/C2418) is used as a voltage source during scan. The sawtooth current of the deflection through this capacitor creates the required parabolic voltage. This correction is called S-Correction.

Mannheim-Circuit

When the EHT is heavily loaded with a bright line, the flyback time can be increased a bit in this situation. As a result, the scan delays a bit causing a DC-shift to the right in the next line, which would create a small spike on the S-cap. This spike oscillates with the inductance of the deflection coil and the primary of LOT. The result is visible in vertical lines under horizontal white line. This is called the Mannheim-effect.

To prevent this from happening, a circuit called Mannheim-circuit is added. This consists of C2415, R3404, R3417 and D6406. During the scan, C2415 is charged via R3417. During the flyback, the S-correction parabola across the S-Cap C2417/C2418 is in its most negative, and D6406 conducts. Thus, C2415 is switched in parallel to C2417/C2418 during flyback. As C2415 is much larger than C2417/C2418, the voltage across C2415 reduces the Mannheim-effect oscillation.

Class D East-West Driver

To reduce the power loss of the normal used linear East-West amplifier, a class-D East-West circuit is used. To achieve this, the East-West parabola waveform EW_DRIVE from the Hercules (frame frequency) is sampled with a saw tooth (line

frequency) taken from the line aux output. Then a series of width-modulated pulses is formed via two inverted phase amplifiers, filtered by an inductor, which then directly drive the diode modulated line circuit.

East-West Correction

To achieve a good geometry, **dynamic** S-correction is needed. The design is such that the tube/yoke needs East-West correction. Besides that, an inner pincushion is present after East-West correction. The line deflection is modulated with a parabolic voltage (frame frequency). In this way it is not so much at top and bottom, and much more in the middle.

Upon entering the picture geometry menu in the SAM mode, the following corrections will be displayed.

- EWW: East West Width.
- EWP: East West Parabola.
- UCP: Upper Corner Parabola.
- LCP: Lower Corner Parabola.
- EWT: East West Trapezium.

The East-West drive circuit realizes them all. The settings can be changed by a remote control. All changed data will be stored into the NVM after the geometry alignment.

Panorama

For Wide Screen sets, the S-correction of the picture has to adapt between the different picture modes. In particular, between 16:9 Wide Screen and 4:3 picture modes. This is achieved with the (separate) Panorama circuit (see diagram "G"). A signal (I2SDI1) from the UOC controls the state of TS7463. When in the normal 16:9 Wide Screen mode, the signal is "low" and therefore TS7463 is switched "off". When the 4:3 mode is selected, this signal from the UOC is pulled "high", switching TS7463 "on". The relay 1463 on the Panorama panel is subsequently turned "on" and, in effect, paralleling capacitor C2475/C2474 to the S-Cap C2469/C2470. This changes the overall effective S-correction. The relay is switched "on" in 4:3 and Superwide picture modes.

9.3.3 Auxiliary Voltages

The horizontal deflection provides various auxiliary voltages derived either directly or indirectly from the secondary pins of the LOT:

- +9V: This supplies the Hercules's flyback driver.
- +11V: This supplies the frame amplifier.
- -12V: This supplies the frame amplifier.
- 50V: This supplies the frame amplifier.
- Filament: This supplies the heater pins of the picture tube.
- VideoSupply (+200V from primary side of LOT): This supplies the RGB amplifier and Scavem circuit at the CRT panel.

Notes:

- The V_T voltage (to tuner) is drawn from V_batt.
- The EHT voltage is generated by the Line Output Transformer (LOT). The Focus and Vg2 voltages are created with two potentiometers integrated in the transformer.

9.3.4 Beam Current

The beam current is adjusted with R3451 and R3452. The components R3473, R3453 and C2451 determine the EHT_info characteristic. The voltage across C2412 varies when the beam current changes. This EHT_info is used to compensate the picture geometry via pin 97 of the Hercules when the picture changes rapidly, and compensate the phase 2 loop via pin 113 of the Hercules. Also from the EHT_info line, a BCL signal is derived and sent to the Hercules for controlling the picture's contrast and brightness.

When the picture content becomes brighter, it will introduce:

- Geometry distortion due to the impedance of the LOT causing the EHT to drop.
 - Picture blooming due to the picture characteristics
- Because of the above mentioned, we will need a circuit for Beam Current Limiter (BCL) and EHT compensation (EHT_info). These two circuits derive the signal from the picture tube current info through LOT pin 10.

BCL

- When the BCL pin voltage goes to 2.8 V, the Hercules will start to limit CONTRAST gain.
- When it reaches 1.7 V, then the BRIGHTNESS gain limit will start to react.
- When BCL pin voltage goes to 0.8 V, the RGB will be blanked.

Components TS7483, R3490, R3491, R3492, and C2483 are for fast beam current limiting (e.g. with a Black-to-White pattern).

Components R3454, D6451, D6450, C2453, R3493, and C2230 are for average beam current limiting. C2453 and R3493 also control the timing where average beam current limiting is more active or less active.

EHT_info

The "PHI2 correction" is to correct the storage time deviation of the Line Output Transistor, which is causing geometry distortion due to brightness change.

Line EHT_info is to correct the geometry distortion due to EHT deviation.

Both of them feedback through the EHTO and PH2LF pin, and correct the geometry through the East-West circuit.

Power Down

The power down connection is for EHT discharge during AC Power "Off" state. In the Hercules, if EHT_info > 3.9 V, it will trigger the X-ray protection circuit via a 2fH soft stop sequence. The Hercules bits OSO (Switch Off in Vertical Over scan) and FBC (Fixed Beam Current Switch Off) will discharge the EHT with 1mA cathode current at over-scan position.

During switch-off, the H_out frequency is doubled immediately and the duty cycle is set to 25% fixed, during 43 ms. The RGB outputs are driven "high" to get a controlled discharge of the picture tube with 1 mA during 38 ms. This will decrease the EHT to about half the nominal value (= safety requirement).

When bit OSO is set, the white spot/flash during switch-off will be written in overscan and thus will not be visible on the screen. Careful application must guarantee that the vertical deflection stays operational until the end of the discharge period.

9.3.5 DAF

The Dynamic Astigmatic Focus (DAF) circuit is required by 34RF sets only. It provides vertical DAF and horizontal DAF. Both of the parabola signals are derived through integration by using chassis available signals:

- The vertical parabola is using RC integration (via R3403 and C2401) on the Frame sensing resistor saw tooth (Frame_FB).
- The horizontal parabola is obtained by 2 RC integration (R3409, R3410, C2402, C2403) on the +9V LOT output.

Both of the parabolas are added on the output stage through adder TS7402 and TS7403. The collector of TS7402 emitter-drives TS7401 and is amplified by pull up resistor R3411. D6401 and C2405 provide the rectified supply voltage.

9.3.6 X-ray Protection

The X-ray protection circuit rectifies the filament voltage and uses it to trigger TS7481 when the EHT is too high. TS7481 is biased at "off" condition by D6480, R3482, and R3483 during normal operation. When the EHT goes too high, the voltage

across R3482 will tend to increase as well, while the voltage across D6481 is fixed. Up to certain level (triggering point), TS7481 will be "on" and will force the EHT_info > 3.9 V. The chassis will be shut down through a soft stop sequence.

9.3.7 Vertical Deflection

The Frame stage consists fully of discrete components. This has the advantage for better flash behavior than when an IC was used.

The Frame differential drive signal from the Hercules comes from a current source. Resistors R3460 and R3461 convert them into a voltage, and feed them into the differential amplifier TS7455 and TS7456. The output of TS7456 is input to the next amplification stage of TS7452. Finally, TS7451 and TS7453 deliver the Vertical yoke current to the coil and feedback through the sensing resistors R3471 and R3472.

D6458 and TS7454 are used to bias TS7451 and TS7453, to get rid of zero crossovers, which can cause horizontal lines at the screen center.

The negative supply is from -12V and the positive scanning supply is from +12V through D6459. The flyback supply is derived from D6455, D6456 and C2456. This circuit is a voltage doubler, which stores energy in C2456 during the Line flyback period and delivers the energy to C2465 during the Line scanning period. Throughout the Frame period, the charging and discharging of C2456 works alternatively. However, at the first half of the Frame scanning, TS7451 is "on" and consumes all the charge from C2456. When entering 2nd half Frame period, TS7451 is "off", so C2456 will gradually charge up to the required flyback supply.

C2463, R3464 and D6457 are for boosting the base voltage of TS7451 during the flyback period and the 1st half Frame period as well. C2463 is charged by D6457 during the 2nd half scanning. R3467 and R3468 are for oscillation damping.

The V_guard protection is to protect the Frame stage if a fault condition happens. The V_guard will sense the pulse with voltage > 3.8 V and period < 900 us. Any signal out of this range will be considered as fault, and the chassis will be shut down.

9.3.8 Tilt and Rotation

The rotation control signal is a PWM output from the UOC. It is filtered by R3252, R3246, R3259 and C2259. The DC voltage after filtering at C2259 will be amplified by R3245 (Main Board) and R3390 (CRT panel).

The output stage functions similarly as in M8/L01.1 with rotation IC TDA8941P. TS7331/TS7382 and TS7332/TS7381 will function alternatively corresponding to the rotation setting.

9.3.9 CRT panel

The RGB amplifier stage is exactly the same as in M8/L01.1. However, the RGB amplifier IC has been changed to TDA6107AJF or TDA6108AJF. The "A" indication is with gain of "80" rather than "50" in M8/L01.1. The diode D6332 used in the former chassis, to solve the bright screen during start up, is not required because this IC has the error correction implemented.

Scavem

In certain versions, the Scavem feature is used to enhance the sharpness of the picture. The RGB signals are first differentiated and subsequently amplified before feeding to an auxiliary coil known as the SVM coil. The current, flowing through the SVM coil during the picture intensity transients, modulates the deflection field and thus the scan velocity.

During the first half of the intensity increase, the scan velocity is increased (thus decreasing the current density by spreading it on a wider area). During the second half of the intensity increase, the scan velocity is decreased (increasing the current density by concentrating it on a smaller area). The increasing current density transition is sharpened. A decreasing current density transition is processed in a similar way and is also sharpened.

In this chassis the SCAVEM signal is different from its predecessor because the Hercules generates the differential SCAVEM signal inside the IC.

The supply of the SCAVEM is taken from V_bat through a 1k5 / 5 W resistor. Compared with the M8/L01.1, this has the advantage of getting better performance for the pattern with tremendous SCAVEM current (like V_sweep). In this former chassis, because the supply was taken from the 200 V through a 8k2 / 5 W resistor, the supply dropped significantly during a large SCAVEM current. In this chassis, the drop due to the pattern will be less because of the lower supply voltage impedance.

In the Main Board, 1st stage amplification is taken care by 7208 with the pull up resistors (3361, 3387) located in the CRT panel.

TS7361 and TS7362 is the current buffer delivering the current to the output stage. The diode D6361 is to lightly bias these transistors, to get rid of the zero crossover of the stage. After that, the signal is ac-coupled to TS7363 and TS7364 where the emitter resistors (R3364 and R3370) will determine the final SCAVEM current. TS7363 and TS7364 are biased by R3363, R3366, R3367 and R3368.

C2387, R3388, R3389, R3365, R3369, C2384, and C2385 are used for suppressing unwanted oscillations.

The function of TS7376 is to limit the SCAVEM current from going too high. It basically senses the voltage after R3373 and clamps the SCAVEM signal through D6367 and C2376.

9.4 Control

The Micro Controller is integrated with the Video Processor, and is called the Hercules. For dynamic data storage, such as SMART PICTURE and SMART SOUND settings, an external NVM IC is being used.

Another feature includes an optional Teletext/Closed Caption decoder with the possibility of different page storage depending on the Hercules type number.

The Micro Controller ranges in ROM from 128 kB with no TXT-decoder to 128 kB with a 10 page Teletext or with Closed Caption.

9.4.1 Block Diagram

The block diagram of the Micro Controller application is shown below.

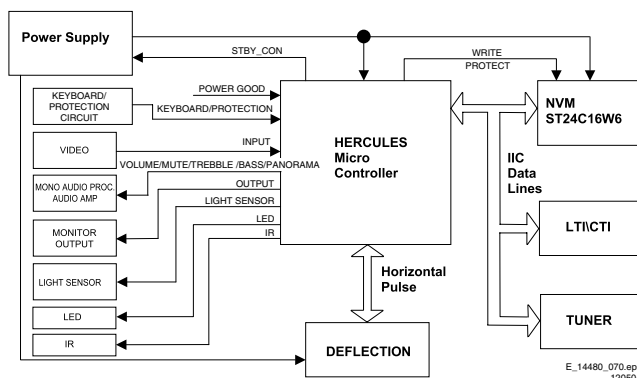


Figure 9-4 Micro Controller block diagram

9.4.2 Basic Specification

The Micro Controller operates at the following supply voltages:

- +3.3 V_{dc} at pins 33, 125, and 19.
- +1.8 V_{dc} at pins 126, 36, and 33.
- I2C pull up supply: +3.3V_{dc}.

9.4.3 Pin Configuration and Functionality

The ports of the Micro Controller can be configured as follows:

- A normal input port.
- An input ADC port.
- An output Open Drain port.
- An output Push-Pull port.
- An output PWM port.
- Input/Output Port

The following table shows the ports used for the L04 control:

Table 9-4 Micro Controller ports overview

Pin	Name	Description	Configuration
32	INT0/ P0.5	IR	INT0
31	P1.0/ INT1	PWRDOWN	INT1
30	P1.1/ T0	LED	P1.1
27	P0.4/ I2SWS	(for future use)	-
26	P0.3/ I2SCLK	(for future use)	-
25	P0.2/ I2SDO2	SEL_SC2_INTERF ACE/ SDM	P0.2
24	P0.1/ I2SDO1	(for future use)	P0.1
23	P0.0/ I2SDI/O	Panorama	P0.0
22	P1.3/ T1	Write Protect	P1.3
21	P1.6/ SCL	SCL	SCL
20	P1.7/ SDA	SDA	SDA
18	P2.0/ TPWM	VOL_MUTE	P2.0
17	P2.1/ PWM0	ROTATION	PWM0
16	P2.2/ PWM1	SEL_LL/M	P2.2
15	P2.3/ PWM2	STANDBY_CON	P2.3
14	P3.0/ ADC0	Light Sensor	ADC0
13	P3.1/ ADC1	(for future use)	-
10	P3.2/ ADC2	(for future use)	-
9	P3.3/ ADC3	KEYBOARD	ADC3
7	P2.4/ PWM3	A (for future use)	P2.4
6	P2.5/ PWM4	B (for future use)	P2.5
3	P1.2/ INT2	C (for future use)	INT2
2	P1.4/ RX	E (for future use)	-
1	P1.5/ TX	D (for future use)	-

The description of each functional pin is explained below:

- **LED.** This signal is used as an indication for the Standby, Remote and Error Indicator. Region diversity:
 - During protection mode, the LED blinks and the set is in standby mode.
 - During error conditions it blinks at a predefined rate.
 - After receiving a valid RC-5 or local keyboard command it flashes once.
 - For sets with error message indication, the LED blinks when message is active and the set is in standby mode.

Table 9-5 LED signal diversity

LED	Europe	AP/ LATAM	NAFTA
0	LED brighter Standby	LED lighted Standby	LED lighted Normal
1	LED dimmer Normal	LED "off" Normal	LED "off" Standby

- **SCL.** This is the clock wire of the two-wire single master bi-directional I2C bus.
- **SDA.** This is the data wire of the two-wire single master bi-directional I2C bus.
- **STDBY_CON.** The Hercules generates this signal. This can enable the MAIN SMPS in normal operation and

- disable it during Standby. It is of logic “low” (0 V) under normal operation and “high” (3.3 V) during Standby.
- IR.** This input pin is connected to an RC5 remote control receiver.
 - SEL-IF-LL’/ M-TRAP.** For AP: All L04 AP sets are Multi System QSS set. This is an output pin to switch the Video SAW filter between M system and other systems.
 - 0: NTSC M (default)
 - 1: PAL B/G, DK, I, L
 - Write Protect.** The global protection line is used to enable and disable write protection to the NVM. When write to the NVM is required, pin 7 of the NVM must be pulled to logic ‘0’ first (via Write_Protect of the micro-controller pin) before a write is performed. Otherwise pin 7 of NVM must always be at logic “1”
 - 0: Disabled
 - 1: Enabled (default)
 - Mute.** This pin is use to MUTE the audio amplifier. It is configured as push pull.
 - Rotation.** This pin is configured as PWM for the Rotation feature. The output of the PWM is proportional to the feature control.
 - Light Sensor.** This pin is configured as ADC input for the Light Sensor.
 - Sel_SC2_Interface.** This pin is use to switch between the SC2_CVBS_OUT and the INTF_CVBS_OUT for the SCART_2_CVBS_OUT/ MONITOR_OUT signal.
 - 0: Hercules CVBS Output (default)
 - 1: Interface CVBS Output
 - PWRDOWN.** The AUX SMPS generates this signal. Logic “high” (3.3 V) under normal operation of the TV and goes “low” (0 V) when the Mains input voltage supply goes below 70 V_{ac}.
 - Keyboard.** Following are the Keyboard functions and the step values (8 bit) for it.

Table 9-6 Local keyboard values

Function	Voltage (V _{dc})	Step values (8 bit)
NAFTA Standby	0	0 - 6
Ch +	0.43	7 - 33
Exit Factory (Ch- and Vol-)	0.69	34 - 53
Ch -	0.93	54 - 73
Menu (Vol - and Vol +)	1.19	74 - 96
Vol -	1.49	97 - 121
DVD Eject	1.8	122 - 147
Vol +	2.12	148 - 169

- SDM.** This pin is configured as Open Drain during the cold start only. If this pin is shorted to ground during cold start, it will enter the SDM mode (for Service use).
- ISP.** This pin is configured as Open Drain during the cold start only. If this pin is shorted to ground during cold start, it will enter the ISP mode (for Service use).
- PANEL.** This pin is configured as Open Drain during the cold start only. If this pin is shorted to ground during that, then it will enter to the PANEL mode.
- ResetEnabled.** This is an output pin to switch the control transistor (pos. TS7202) “high” or “low” for the reset of 1.8 V in case there is a corruption in the Hercules.

9.5 Tuner and IF

The tuner used in this chassis comes from two sources, from Philips and from Alps. Both tuner sources have the same pin configuration so they are 1 to 1 compatible except for the software, which will be selected by means of Option Settings.

Some features:

- Multi-Standard alignment free PLL-IF, including SECAM L/ L’.
- Integrated IF-AGC time constant.

- Integrated sound band-passes and traps (4.5 / 5.5 / 6.0 / 6.5 MHz).
- Group delay compensation (for NTSC and for PAL).
- QSS versions with digital Second-Sound-IF SSIF (AM demodulator for free).
- FM mono operation possible: Inter-Carrier or QSS.

9.5.1 Diversity

The following Tuners can be present (depending on the region and the set execution):

- Normal tuner without PIP.
- FM radio tuner without PIP.
- Normal tuner with PIP (main tuner with splitter).
- FM radio set with PIP (PIP tuner with splitter).

The SAW filter used, depends on the application concept (whether it is a QSS concept or an Intercarrier):

- OFWM3953M for QSS Video.
- OFWK9656M for QSS Audio.
- OFWM1971M for Intercarrier.

9.5.2 Pin Assignments and Functionality

Pin assignment of the Tuner:

Table 9-7 Pinning Tuner

Pin	Pin Description	DC Voltages
1	RF-AGC	4V for Maximum Gain < 4V for Strong Signal Condition
2	FM Radio Input or N.C	-
3	NC (Address Pin)	-
4	SCL	0 to 3.3 V _{dc}
5	SDA	0 to 3.3 V _{dc}
6/7	Supply Voltage	5 V _{dc} +/- 0.25 V
8	N.C	-
9	Tuning Supply Voltage	30 to 35 V _{dc}
10	FM Radio IF Output/Ground	-
11	TV IF Output	-

Pin assignment of the several SAW filters (depends on region/ execution):

Table 9-8 Pinning SAW filters

Pin	QSS Video (item 1002)	QSS Video (item 1003)	QSS Audio (item 1001)	Intercarrier (item 1002)
1	Input	Input	Input	Input
2	Input Ground	Input Ground	Switching Input	Input Ground
3	Ground	Ground	Ground	Ground
4	Output	Output	Output	Output
5	Output	Output	Output	Output
6	-	n.c.	-	-
7	-	n.c.	-	-
8	-	Ground	-	-
9	-	Free	-	-
10	-	Switching input	-	-

The table below shows the switching behavior of SAW filter.

Table 9-9 Switching behavior SAW filter

	Condition	
	High	Low
System	M	BG/DK/I/L

Note: The logic level is measured at the base of transistor 7001.

9.5.3 Option Settings

The option settings for the Tuner type can be found in Option setting 1 of the SAM mode. The Option settings for Option 1 are as follows:

- Option Byte 1
 - Bit 7: OP_PHILIPS_TUNER
 - Bit 6: OP_FM_RADIO
 - Bit 5: OP_LNA
 - Bit 4: OP_ATS
 - Bit 3: OP_ACI
 - Bit 2: OP_UK_PNP
 - Bit 1: OP_VIRGIN_MODE
 - Bit 0: OP_CHINA

For more details on the option settings, please refer to the chapter 8 “Alignments”.

9.6 Source Select

For this chassis, the audio/video source selection is controlled via the Hercules.

The Audio/Video Source Select is one of the more complex functions due to its diversity and complex switching. The Audio/Video Source Select comprises of the following components:

- The Hercules itself for Mono Audio and Video Source Selection.
- The HEF switch for Stereo Audio as well as Video Selection.

9.6.1 Options

The option settings for the Source Selection can be found in Option settings of the SAM mode. The Option settings for Option 5 are as follows:

- Option Byte 5
 - Bit 7: AV1
 - Bit 6: AV2
 - Bit 5: AV3
 - Bit 4: CVI
 - Bit 3: SVHS2
 - Bit 2: SVHS3
 - Bit 1: HOTEL MODE
 - Bit 0:

For more detail on the option settings, please refer to the chapter 8 “Alignments”.

9.6.2 Diversity

The basic diversity of the Audio/Video Source Select is between the Mono and the Stereo sets and the number of Cinch/SCART's as specified in the product specification. The table below shows the Audio/Video Source Select diversity for all regions:

Table 9-10 AV Source Select diversity

Pin	Symbol	Remark
51	R/Pr IN3	AV1 (CVI)
50	G/Y IN3	
49	B/Pb IN3	
52	INSSW3	
74	CVBS2/Y2	
95	AUDIO IN5 L	AV2 (SVHS)
94	AUDIO IN5 R	
73	AUDIO IN3 L	
72	AUDIO IN3 R	
71	CVBS3/Y3	
70	C2/C3	Side (SHVS)
80	AUDIO IN4 L	
79	AUDIO IN4 R	
78	CVBS4/Y4	
77	C4	
81	IFVO/SVO/CVBSI	Monitor Out
67	AUD OUT HP L	
66	AUD OUT HP R	
69	AUD OUT LS L (AUD OUT/AM OUT)	HP/ LS Out
68	AUD OUT LS R	
59	V IN (R/Pr IN2/CX)	Interface
58	U IN (B/Pb IN2)	
57	Y IN (G/Y IN2/CVBS-Yx)	
54	U OUT (INSSW2)	
76	AUDIO IN2 L	
75	AUDIO IN2 R	N.C.
86	DVBO/IFVO/FMRO	
65	CVBSO/PIP	PIP application
56	Y SYNC	100 nF
55	Y OUT	100 nF
53	V OUT (SWO)	N.C.
93	AUD OUT S L	N.C.
92	AUD OUT S R	N.C.

Table 9-11 SCART Source Select diversity

Pin	Symbol	Remark
51	R/Pr IN3	SCART 1
50	G/Y IN3	
49	B/Pb IN3	
52	INSSW3	
74	CVBS2/Y2	
86	DVBO/IFVO/FMRO	SCART 2
95	AUDIO IN5 L	
94	AUDIO IN5 R	
93	AUD OUT S L	
92	AUD OUT S R	
71	CVBS3/Y3	Side I/O
70	C2/C3	
81	IFVO/SVO/CVBSI	
73	AUDIO IN3 L	
72	AUDIO IN3 R	
67	AUD OUT HP L	LS/ HP/ MON OUT
66	AUD OUT HP R	
69	AUD OUT LS L (AUD OUT/AM OUT)	Interface
68	AUD OUT LS R	
59	V IN (R/Pr IN2/CX)	Interface
58	U IN (B/Pb IN2)	
57	Y IN (G/Y IN2/CVBS-Yx)	
54	U OUT(INSSW2)	
76	AUDIO IN2 L	
75	AUDIO IN2 R	for PIP
65	CVBSO/PIP	
56	Y SYNC	100 nF
55	YOUT	100 nF
53	VOU(SWO)	N.C.

9.6.3 Audio Source Selection

The signals coming out of the DEMDEC (internal demodulator/decoder block of the Hercules) are selectable and consist of the following (depending on the transmission):

- DEC L/R (Can be NICAM, FM 2CS, or BTSC Stereo).
- Mono (Refers to fallback/forced Mono in Stereo Transmission).
- SAP.

For L04, the assigned I/O with respect to the Hercules is as follows:

- SCART1 or AV1 Input assigned to **Audio In 5**.
- SCART2 or AV2 Input assigned to **Audio In 3**.
- Side AV Input assigned to **Audio In 4**.
- External Interface Input assigned to **Audio In 2**.
- SCART1 Output assigned to **SCART Output**.
- SCART2 Output (EU) or Monitor Output (LA/NA/AP) assigned to **Headphone Output**.
- Constant Level Output assigned to **Loudspeaker Output**.

9.6.4 Video Source Selection

Video source selection is done inside the Hercules. Therefore it provides a video switch with 3 external CVBS inputs and a CVBS output. All CVBS inputs can be used as Y-input for Y/C signals. However, only 2 Y/C sources can be selected because the circuit has 2 chroma inputs.
All input signals are converted to YUV, and looped through an external interface. This to enable picture improvement features (like LTI/CTI) or PIP.

9.7 Video Processing

The Video Processor is basically the Hercules and the TDA9178 (CTI/LTI). Video processing is done in these two chips such as the Brightness Control, Contrast Control and so on.

- Some features:
- Full YUV-loop interface (alternative functions: DVD, RGB or Y/C).
 - Internal OSD insertion (not Saturation or Contrast controlled).
 - Double window implementation.
 - Linear / non linear scaling for 16:9 sets.
 - Tint (hue) on UV signals (including DVD).
 - Peaking, Coring, Black \ Blue \ White-stretch.
 - Transfer-Ratio and Scavem (also on TXT).

9.7.1 Features

- The features included in the Hercules are as follows:
- Brightness Control.
 - Contrast Control.
 - Saturation Control.
 - Sharpness Control.
 - Peak White Limiter.
 - Beam Current Limiter.
 - Black Stretch (Contrast Plus).

For sets with the TDA9178, there are two extra features:

- Luminance Transient Improvement (LTI).
- Color Transient Improvement (CTI).

9.7.2 Block Diagram

Following diagram is the block diagram of the video processing part:

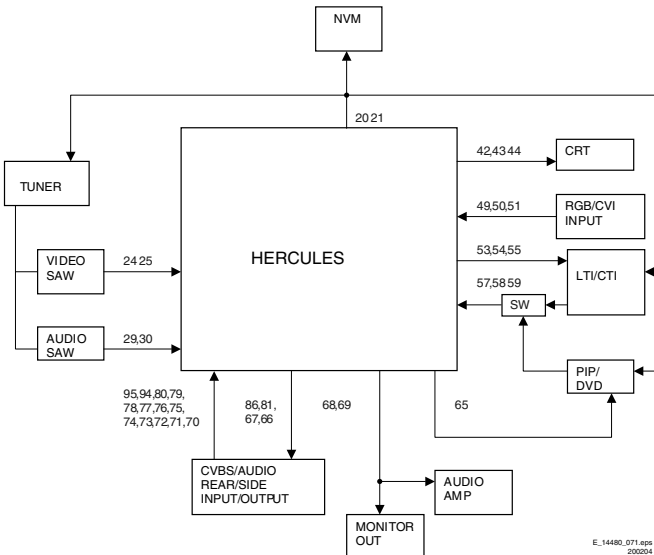


Figure 9-5 Video processing block diagram

9.7.3 LTI/CTI

The TDA9178 is an I2C-bus controlled IC (INCREDIBLE chip) with YUV interface. This IC can do mainly histogram processing, color transient improvement (CTI) and line transient improvement (LTI).

- Luminance Vector Processing involves histogram function, which provides scene dependent contrast improvement, adaptive black and white point stretching.
- Color Vector Processing involves skin tone correction, green enhancement and blue stretch.
- Spectral Processor involves step improvement processing, contour processing, smart sharpness control, color dependant sharpness and Color Transient Improvement.
- Noise detector, feature mode detector and cue flash functions.
- Demonstration mode shows all the improvement features in one picture.

Table 9-12 Pinning overview TDA9178

Pin	Symbol	Description
1	SC	Sandcastle input pin
2	n.c.	Not connected pin
3	ADEXT1	External AD-conversion #1 input pin
4	ADEXT2	External AD-conversion #2 input pin
5	ADEXT3	External AD-conversion #3 input pin
6	Y in	Luminance input pin
7	ADR	Address selection input pin
8	U in	-(B-Y) signal input pin
9	V in	-(R-Y) signal input pin
10	TP	Testpin, connected to ground
11	SCL	I2C-bus: clock input pin
12	n.c.	Not connected pin
13	n.c.	Not connected pin
14	SDA	I2C-bus: data input pin
15	DECDIG	Decoupling digital supply
16	V out	-(R-Y) signal output pin
17	U out	-(B-Y) signal output pin
18	V ee	Ground pin
19	Y out	Luminance output pin
20	V cc	Supply-voltage pin
21	S out	Luminance output for SCAVEM
22	CF	Cue-flash output pin
23	n.c.	Not connected pin
24	n.c.	Not connected pin

9.7.4 Options

The option settings allow for process of the video as per set specification. The option settings can be found in "Option 2" and "Option 6" in the SAM mode. The option settings are as follows:

- Option Byte 2
 - Bit 7: OP_GREEN_UI
 - Bit 6: OP_GREEN_UI
 - Bit 5: OP_CHANNEL_NAMING,
 - Bit 4: OP_LTI,
 - Bit 3: OP_TILT,
 - Bit 2: OP_FINE_TUNING
 - Bit 1: OP_PIP_PHILIPS_TUNER,
 - Bit 0: OP_HUE,
- Option Byte 6
 - Bit 7: OP_PERSONAL_ZAPPING,
 - Bit 6:
 - Bit 5: OP_FMTRAP
 - Bit 4: OP_COMBFILTER
 - Bit 3: OP_ACTIVE_CONTROL
 - Bit 2: OP_VIDEO_TEXT
 - Bit 1: OP_LIGHT_SENSOR,
 - Bit 0: OP_DUAL_TEXT

For more details on the option settings, please refer to the chapter 8 "Alignments".

9.8 Audio Processing

The audio decoding is done entirely via the Hercules. The IF output from the Tuner is fed directly to either the Video-IF or the Sound-IF input depending on the type of concept chosen. There are mainly two types of decoder in the Hercules, an analog decoder that decodes only Mono, regardless of any standards, and a digital decoder (or DEMDEC) that can decode both Mono as well as Stereo, again regardless of any standards.

In this chassis, the analog decoder is used in two cases:

- It is used for AM Sound demodulation in the Europe SECAM LL' transmission.
- It is used for all FM demodulation in AP AV-Stereo sets.

9.8.1 Diversity

The diversity for the Audio decoding can be broken up into two main concepts:

- The Quasi Split Sound concept used in Europe and some AP sets.
- The Inter Carrier concept, used in NAFTA and LATAM.

The UOC-III family makes no difference anymore between QSS- and Intercarrier IF, nearly all types are software-switchable between the two SAW-filter constructions.

Simple data settings are required for the set to determine whether it is using the Inter Carrier or the QSS concept. These settings are done via the "QSS" and "FMI" bit found in SAM mode. Due to the diversity involved, the data for the 2 bits are being placed in the NVM location and it is required to write once during startup.

On top of that, it can be further broken down into various systems depending on the region. The systems or region chosen, will in turn affect the type of sound standard that is/are allowed to be decoded.

- For the case of **Europe**, the standard consists of BG/DK/I/LL' for a Multi-System set. There are also versions of Eastern Europe and Western Europe set and the standard for decoding will be BG/DK and I/DK respectively. FM Radio is a feature diversity for the Europe sets. The same version can have either FM Radio or not, independent of

the system (e.g. sets with BG/DK/I/LL' can have or not have FM radio).

- For the case of **NAFTA** and **LATAM**, there is only one transmission standard, which is the M standard. The diversity then will be based on whether it has a dBx noise reduction or a Non-dBx (no dBx noise reduction).
- For the case of **AP**, the standard consists of BG/DK/I/M for a Multi-System set. The diversity here will then depends on the region. AP China can have a Multi-System and I/DK version. For India, it might only be BG standard.

9.8.2 Functionality

The features available in the Hercules are as follows:

- Treble and Bass Control.
- Surround Sound Effect that includes:
 - Incredible Stereo.
 - Incredible Mono.
 - 3D Sound (not for AV Stereo).
 - TruSurround (not for AV Stereo).
 - Virtual Dolby Surround, VDS422 (not for AV Stereo).
 - Virtual Dolby Surround, VDS423 (not for AV Stereo).
 - Dolby Pro-Logic (not for AV Stereo).
- Bass Feature that includes:
 - Dynamic Ultra-Bass.
 - Dynamic Bass Enhancement.
 - BBE (not for AV Stereo).
- Auto-Volume Leveler.
- 5 Band Equalizer.
- Loudness Control.

All the features stated are available for the Full Stereo versions and limited features for the AV Stereo

9.9 Audio Amplifier

The audio amplifier part is very straightforward. It uses the integrated power amplifier TDA2616Q, and delivers a maximum output of 2 x 10 W_{rms}.

The maximum operating condition for this amplifier is 21 V unloaded. Normal operating supply is from 7.5 V to 16 V. Muting is done via the VOLUME_MUTE line connected to pin 2 of the amplifier-IC and coming from the UOC.

The following table shows pin functionality of the Audio Amplifier:

Table 9-13 Pinning overview TDA2616

Pin	Pin Name	Normal Operation
1	Input Left	Input AC signal
2	Mute	16 V _{dc}
3	Ground	0 V
4	Output L Channel	AC waveform
5	Supply Voltage (negative)	-16 V _{dc}
6	Output R Channel	AC waveform
7	Supply Voltage (positive)	+ 16 V _{dc}
8	Inverting inputs L and R	0 V
9	Input Right	Input AC signal

9.10 Abbreviation list

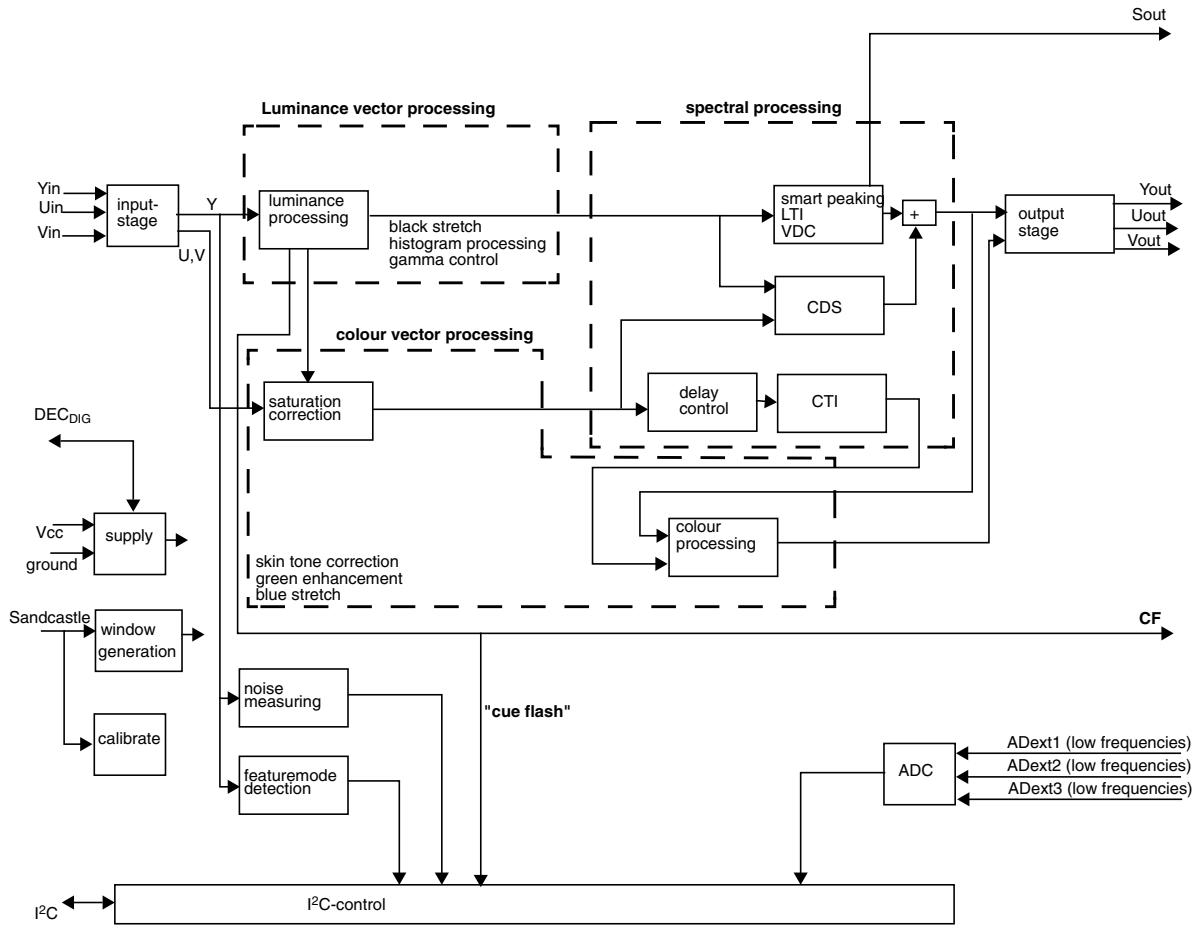
2CS	2 Carrier (or Channel) Stereo	IIC	Integrated IC bus
ACI	Automatic Channel Installation: algorithm that installs TV sets directly from cable network by means of a predefined TXT page	ITV	Institutional TV
ADC	Analogue to Digital Converter	LATAM	Latin American countries like Brazil, Argentina, etc.
AFC	Automatic Frequency Control: control signal used to tune to the correct frequency	LED	Light Emitting Diode
AFT	Automatic Fine Tuning	L/L'	Monochrome TV system. Sound carrier distance is 6.5 MHz. L' is Band I, L is all bands except for Band I
AGC	Automatic Gain Control: algorithm that controls the video input of the feature box	LS	Large Screen or Loudspeaker
AM	Amplitude Modulation	M/N	Monochrome TV system. Sound carrier distance is 4.5 MHz
AP	Asia Pacific region	NC	Not Connected
AR	Aspect Ratio: 4 by 3 or 16 by 9	NICAM	Near Instantaneous Compounded Audio Multiplexing. This is a digital sound system, mainly used in Europe.
ATS	Automatic Tuning System	NTSC	National Television Standard Committee. Color system mainly used in North America and Japan. Color carrier NTSC M/N = 3.579545 MHz, NTSC 4.43 = 4.433619 MHz (this is a VCR norm, it is not transmitted off-air)
AV	External Audio Video	NVM	Non Volatile Memory: IC containing TV related data e.g. alignments
AVL	Automatic Volume Leveler	OB	Option Bit
BCL	Beam Current Limitation	OC	Open Circuit
B/G	Monochrome TV system. Sound carrier distance is 5.5 MHz	OP	Option Byte
BTSC	Broadcast Television Standard Committee. Multiplex FM stereo sound system, originating from the USA and used e.g. in LATAM and AP-NTSC countries	OSD	On Screen Display
CC	Closed Caption	PAL	Phase Alternating Line. Color system mainly used in West Europe (color carrier = 4.433619 MHz) and South America (color carrier PAL M = 3.575612 MHz and PAL N = 3.582056 MHz)
CCC	Continuous Cathode Calibration	PCB	Printed Circuit board
ComPair	Computer aided rePair	PLL	Phase Locked Loop. Used for e.g. FST tuning systems. The customer can give directly the desired frequency
CRT	Cathode Ray Tube or picture tube	POR	Power-On Reset
CSM	Customer Service Mode	PTP	Picture Tube Panel (or CRT-panel)
CTI	Color Transient Improvement: manipulates steepness of chroma transients	RAM	Random Access Memory
CVBS	Composite Video Blanking and Synchronization	RC	Remote Control handset
CVI	Component Video Input	RGB	Red, Green, and Blue video signals
DAC	Digital to Analogue Converter	ROM	Read Only Memory
DBX	Dynamic Bass Expander or noise reduction system in BTSC	SDAM	Service Default / Alignment Mode
D/K	Monochrome TV system. Sound carrier distance is 6.5 MHz	SAP	Second Audio Program
DFU	Direction For Use: description for the end user	SC	Sandcastle: pulse derived from sync signals
DNR	Dynamic Noise Reduction	S/C	Short Circuit
DSP	Digital Signal Processing	SCL	Serial Clock
DST	Dealer Service Tool: special remote control designed for dealers to enter e.g. service mode	SDA	Serial Data
DVD	Digital Versatile Disc	SECAM	SEquence Couleur Avec Memoire. Color system mainly used in France and East Europe. Color carriers = 4.406250 MHz and 4.250000 MHz
EEPROM	Electrically Erasable and Programmable Read Only Memory	SIF	Sound Intermediate Frequency
EHT	Extra High Tension	SS	Small Screen
EHT-INFO	Extra High Tension information	STBY	Standby
EPG	Electronic Programming Guide	SVHS	Super Video Home System
EU	Europe	SW	Software
EW	East West, related to horizontal deflection of the set	THD	Total Harmonic Distortion
EXT	External (source), entering the set via SCART or Cinch	TXT	Teletext
FBL	Fast Blanking: DC signal accompanying RGB signals	uP	Microprocessor
FILAMENT	Filament of CRT	UOC	Ultimate One Chip
FM	Field Memory or Frequency Modulation	V	Vertical sync signal
H	Horizontal sync signal	V_BAT	Main supply voltage for the deflection stage (mostly 141 V)
HP	Headphone	V-chip	Violence Chip
I	Monochrome TV system. Sound carrier distance is 6.0 MHz	VCR	Video Cassette Recorder
I2C	Integrated IC bus	WYSIWYR	What You See Is What You Record: record selection that follows main picture and sound
IF	Intermediate Frequency	XTAL	Quartz crystal
		YC	Luminance (Y) and Chrominance (C) signal

9.11 IC Data Sheets

9.11.1 Diagram H, TDA9178 (IC7610)

This section shows the internal block diagrams and pin layouts of ICs that are drawn as "black boxes" in the electrical diagrams (with the exception of "memory" and "logic" ICs).

BLOCK DIAGRAM



PIN CONFIGURATION

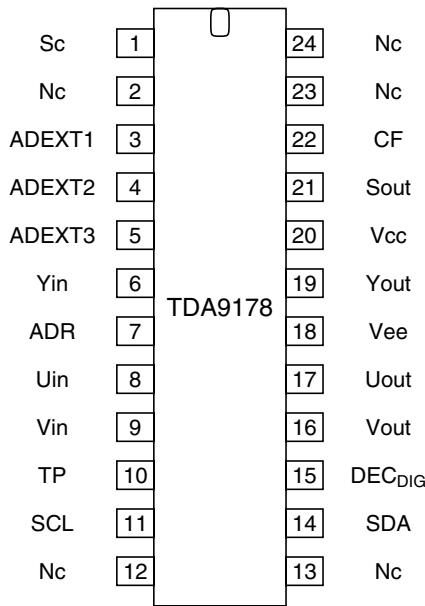


Figure 9-6 Internal Block Diagram and Pin Configuration

10. Spare Parts List

Not applicable

11. Revision List

First release.